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TECHNICAL REPORT 90-019

**A SURVEY OF FLEET  
OPINIONS REGARDING UNAIDED  
VISION TRAINING TOPICS**

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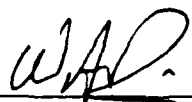
**DECEMBER 1990**


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## REPORT DOCUMENTATION PAGE

|   |       |  |   |                               |
|---|-------|--|---|-------------------------------|
| 1a REPORT SECURITY CLASSIFICATION<br>UNCLASSIFIED   |       |  | 1b RESTRICTIVE MARKINGS   |                               |
| 2a SECURITY CLASSIFICATION AUTHORITY  |       |  | 3 DISTRIBUTION/AVAILABILITY OF REPORT<br>APPROVED FOR PUBLIC RELEASE. DISTRIBUTION UNLIMITED. |                               |
| 2b DECLASSIFICATION/DOWNGRADING SCHEDULE  |       |  |   |                               |
| 4 PERFORMING ORGANIZATION REPORT NUMBER(S)  |       |  | 5 MONITORING ORGANIZATION REPORT NUMBER(S)<br>NTSC-TR-90-D19                                  |                               |
| 6a NAME OF PERFORMING ORGANIZATION<br>NAVAL TRAINING SYSTEMS<br>CENTER  |       | 6b OFFICE SYMBOL<br>(If applicable)<br>262 | 7a NAME OF MONITORING ORGANIZATION  |                               |
| 6c ADDRESS (City, State, and ZIP Code)<br>12350 Research Parkway<br>Orlando, Florida 32826-3224   |       |  | 7b ADDRESS (City, State, and ZIP Code)  |                               |
| 8a NAME OF FUNDING/SPONSORING ORGANIZATION  |       | 8b OFFICE SYMBOL<br>(If applicable)        | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER   |                               |
| 8c ADDRESS (City, State, and ZIP Code)  |       |  | 10. SOURCE OF FUNDING NUMBERS   |                               |
|   |       |  | PROGRAM<br>ELEMENT NO.  | PROJECT<br>NO.                |
|   |       |  | TASK<br>NO.   | WORK UNIT<br>ACCESSION NO.    |
| 11 TITLE (Include Security Classification)<br><br>A survey of fleet opinions regarding unaided vision training topics.  |       |  |   |                               |
| 12 PERSONAL AUTHOR(S)<br>E. Trautman, W. Little* and M. Mittleman* Naval Aerospace Medical Institute  |       |  |   |                               |
| 13a TYPE OF REPORT  |       | 13b TIME COVERED<br>FROM _____ TO _____    | 14. DATE OF REPORT (Year, Month, Day)   |                               |
|   |       |  | 15 PAGE COUNT   |                               |
| 16 SUPPLEMENTARY NOTATION   |       |  |   |                               |
| 17 COSATI CODES   |       |  | 18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)              |                               |
| FIELD   | GROUP | SUB-GROUP                                  | Unaided Vision Training, Night Vision Training  |                               |
|   |       |  |   |                               |
|   |       |  |   |                               |
| 19 ABSTRACT (Continue on reverse if necessary and identify by block number)<br>Unaided vision topics have been a part of aircrew training since at least World War II. Yet, little information exists regarding the operational utility of the instruction. This survey required 341 Navy and Marine Corps pilots to rate the frequency of traditional training concerns as "a real problem for operational flying." A forced choice, four point scale including NEVER, SELDOM, OFTEN, and ALWAYS response options was used. None of the 14 topics considered obtained an overall mode response rating of less than SELDOM. The topic of Veiling Glare obtained a mode rating of ALWAYS. The frequently researched topic of Dark Focus was among those topics receiving mode ratings of SELDOM. No well-defined differences among aircraft communities were revealed. |       |  |   |                               |
| 20 DISTRIBUTION/AVAILABILITY OF ABSTRACT<br><input type="checkbox"/> UNCLASSIFIED UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS  |       |  | 21 ABSTRACT SECURITY CLASSIFICATION   |                               |
| 22a NAME OF RESPONSIBLE INDIVIDUAL<br>LCDR EDWARD TRAUTMAN  |       |  | 22b TELEPHONE (Include Area Code)<br>(407) 380-4839   | 22c OFFICE SYMBOL<br>Code 262 |

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## ACKNOWLEDGMENTS

The authors wish to thank Lieutenant Commanders David Still, Ryan Eichner and Richard Mason. Each contributed extensively to the review and development of the questionnaire. The execution of the survey would not have been possible without the cooperation of numerous aviation physiology training personnel who distributed and administered the questionnaires, nor would it have been possible without the overall support provided by the Institute for Simulation and Training, University of Central Florida, Orlando, Florida. Particular appreciation is directed to Dr. Richard Gilson who proposed the concept of this survey.

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## EXECUTIVE SUMMARY

### PROBLEM

Recent attention has been directed to improving curriculum and presentation methods for instructing basic unaided vision topics. These topics have been a part of the Naval Aviation Physiology Training Program for aircrew training since at least World War II. Although the importance of the topics seems obvious to both researchers and instructors, very little information exists to support the actual fleet utility of the instruction. Fleet opinions regarding the value of current unaided vision training are essentially unavailable in existing literature.

### OBJECTIVE

This effort sampled Navy and Marine Corps pilot opinions regarding visual deficiencies and illusions presented in basic unaided vision training. This was intended as an initial accumulation of operationally based information for constructive criticism of long held assumptions in this important area of aircrew training.

### APPROACH

A sample of 341 maritime, helicopter and tactical pilots was obtained from Navy and Marine Corps communities across the United States. Selected pilots were surveyed using a specially developed questionnaire administered as part of routine aviation physiology training. Subjects were presented a series of topics, each including a brief explanation of the visual deficiency and a matrix for rating the frequency of the problem in a variety of operational scenarios. Response options for rating the deficiencies as a "real problem for operational flying" were limited to a forced choice scale of ALWAYS/OFTEN/SELDOM/NEVER.

### FINDINGS

None of the 14 topics considered obtained an overall mode response rating of less than seldom. The topic of Veiling Glare obtained a mode rating of ALWAYS. The frequently researched topic of Dark Focus was among those topics receiving mode ratings of SELDOM. No well-defined differences among aircraft communities were revealed.

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### CONCLUSION

These results indicate that the sampled pilots regard the surveyed visual deficiencies and illusions as real problems for operational flight. This suggests that the traditional content of unaided vision training is perceived as appropriate to the needs of the operational community. ALWAYS ratings for the topic of Veiling Glare might be regarded as an indicator of fleet interest worthy of further consideration. The absence of strong differences among maritime, helicopter and tactical pilots fail to provide justification for tailoring this relatively basic training to the needs of specific communities.



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## INTRODUCTION

Recognizing and understanding common deficiencies in the human visual system are considered essential for proper orientation and safety in flight. Basic vision topics have been a part of aviator training since at least World War II. The Naval Aviation Physiology Training Program curricula are periodically updated but the data base which supports this instruction generally dates back to much earlier research. Likewise, training aids were also developed at an earlier time. Training research in this area has declined as attention shifted toward concern for night vision goggles and laser protection.

In August of 1989 a small group of specialists met at the Naval Aerospace Medical Institute Pensacola to discuss solutions to the shortcomings in basic vision training. It was recognized that, although knowledge had accumulated regarding vision training, very little was documented regarding the importance of vision training topics for specific operational scenarios. Furthermore, no information was available regarding overall fleet concern for the content of the instruction. Development of an understanding of this shortcoming was undertaken as a first step in improving basic unaided vision training.

The following reports a survey of fleet opinion regarding the importance of traditional vision training topics. Specific attention was directed to a sample of Navy and Marine Corps pilots across a variety of scenarios and operational communities. The findings of this effort are a first attempt at collecting information from the operational community. These results are believed to be the only report of fleet feedback in this area of concern. Results of the following effort do not provide an analyses of training effectiveness, but rather an indication of fleet user opinion.

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### APPROACH

#### Target Population and Sampling Method

This survey was intended to collect opinions from Navy and Marine Corps pilots in tactical, Maritime and Helicopter communities. The planned sample proposed 25 pilots at each of 12 sites (i.e., Navy/Marine Corps by East/West by Tactical/Maritime/ Helicopter), for a total of 300 respondents.

Practical considerations of operational training limited distribution of questionnaires to the seven sites indicated in Table 1. Distribution and coordination of the survey was completed under the cognizance of the Aviation Training Model Manager for Naval Aviation Physiology Training at the Naval Aerospace Medical Institute. On-site field management of survey materials was coordinated by the respective Aviation Physiology Training Departments. Participation was essentially mandatory and generally solicited as a part of aviation physiology refresher training. The option of presenting the questionnaire to other aircrew members was exercised at some sites to avoid awkward "pilot only" situations during the training experience. Data from non-pilot participants were not included in this report.

#### Questionnaire Development

A survey instrument was developed to assess pilots' opinions regarding the importance of traditional basic vision training topics. The questionnaire was constructed with the following sections: demographic data, specific items regarding training topics, and open-ended comments. Specific items regarding the practical utility of 14 training topics comprised the bulk of the questionnaire.

Each topic was presented in brief summary form, with an accompanying illustration and in combination with a standard matrix of response options. Ratings of individual topics were requested in each of eight operational scenarios (11 for helicopter aviators). A four point, forced choice scale was used including ALWAYS, OFTEN, SELDOM and NEVER response options for rating the visual deficiency or illusion as a "real problem for operational flying". The topic presentation format and response matrix illustrated in Figure 1 was used throughout the questionnaire.

A total of eight demographic data points and 154 response data points were requested from each helicopter pilot. Three fewer responses per topic were requested of tactical and maritime pilots, for a total of eight demographic data points and 112 response data points.

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Table 1

Survey sites and questionnaire distribution.

| <u>LOCATION</u>   | <u>PRIMARY COMMUNITY<br/>CONSIDERED</u> | <u>QUESTIONNAIRES<br/>PROVIDED</u> |
|---|---|------------------------------------|
| EAST COAST  |   |                                    |
| NAS BRUNSWICK   | NAVY MARITIME *                         | 50                                 |
| NAS NORFOLK   | NAVY TACTICAL **                        | 100                                |
|   | NAVY HELICOPTER                         |                                    |
| MCAS CHERRY POINT   | MARINE MARITIME                         | 150                                |
|   | MARINE TACTICAL                         |                                    |
|   | MARINE HELICOPTER                       |                                    |
| WEST COAST  |   |                                    |
| NAS LEMOORE   | NAVY MARITIME                           | 50                                 |
| NAS MIRAMAR   | NAVY TACTICAL                           | 100                                |
|   | NAVY HELICOPTER                         |                                    |
| MCAS EL TORO  | MARINE MARITIME                         | 150                                |
|   | MARINE TACTICAL                         |                                    |
|   | MARINE HELICOPTER                       |                                    |
| PENSACOLA   | (ALL CATEGORIES)                        | 50                                 |
| * Propeller driven, non-ejection seat, fixed wing aircraft<br>** Fixed wing, ejection seat aircraft |   |                                    |



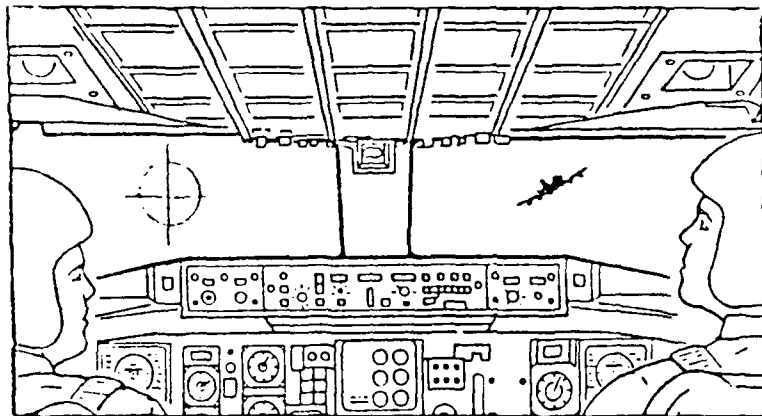
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### Pre-testing of Questionnaire

A draft version of the questionnaire was developed and subjected to internal review. A subsequent preliminary version was reviewed by members of the Naval Aerospace Medical Institute staff and Aerospace Physiologists engaged in unaided vision training. The resulting instrument was pre-tested with a small group of refresher training students at the Naval Aerospace Medical Institute. A final iteration of the instrument was completed following review by the authors. The complete questionnaire is duplicated in Appendix A.

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## BLIND SPOT



Cover you left eye. Concentrate on the  while moving the picture in and out to locate your blind spot.

The area where the optic nerve passes through the retina is totally insensitive to light. This blind spot is in a slightly different place for each eye and is not obvious because views from opposite eyes overlap. Occasionally problems may occur when the view of one eye is inadvertently blocked.

When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

\*Helicopter aviators only

Figure 1. Topic presentation format and response matrix used to solicit aviator opinions regarding each of the basic vision training topics.

## FINDINGS

### Respondents Demographics

The sample included 341 Navy and Marine Corps pilots. The large majority of the respondents were experienced with 86.5 percent reporting more than 500 flight hours. Sample demographics are summarized in Figure 2.

### Response Characteristics

Descriptive statistics. Complete descriptive statistics are provided in appendix B. Summary statistics are provided in figures 3 thru 17. Figure 3 compares most frequently selected responses (i.e., mode statistics) for each of the 14 training topics across the three aircraft communities. Figures 4 thru 17 compare mode statistics for each operational scenario within individual training topics across the three aircraft communities.

Inferential analyses. Kruskal-Wallis One-Way Analyses of Variance were conducted to explore for differences across tactical, helicopter and maritime aircraft communities in the 11 operational scenarios considered in each of the 14 training topics. Operational scenarios specific to the helicopter community were omitted. Several other comparisons were also omitted as a result of their inherent illogical nature (e.g., Autokinesis in Day Carrier Landings). Information provided by these nonparametric analyses indicated significant differences in 22 of the logical cross community comparisons. The results of these analyses are summarized in Table 2.

### Open Ended Comments

Comments in addition to the required ratings were infrequent and typically limited to criticisms of the questionnaire. The responses obtained from the comments section were judged by the authors as too limited to be of additional value to these findings.

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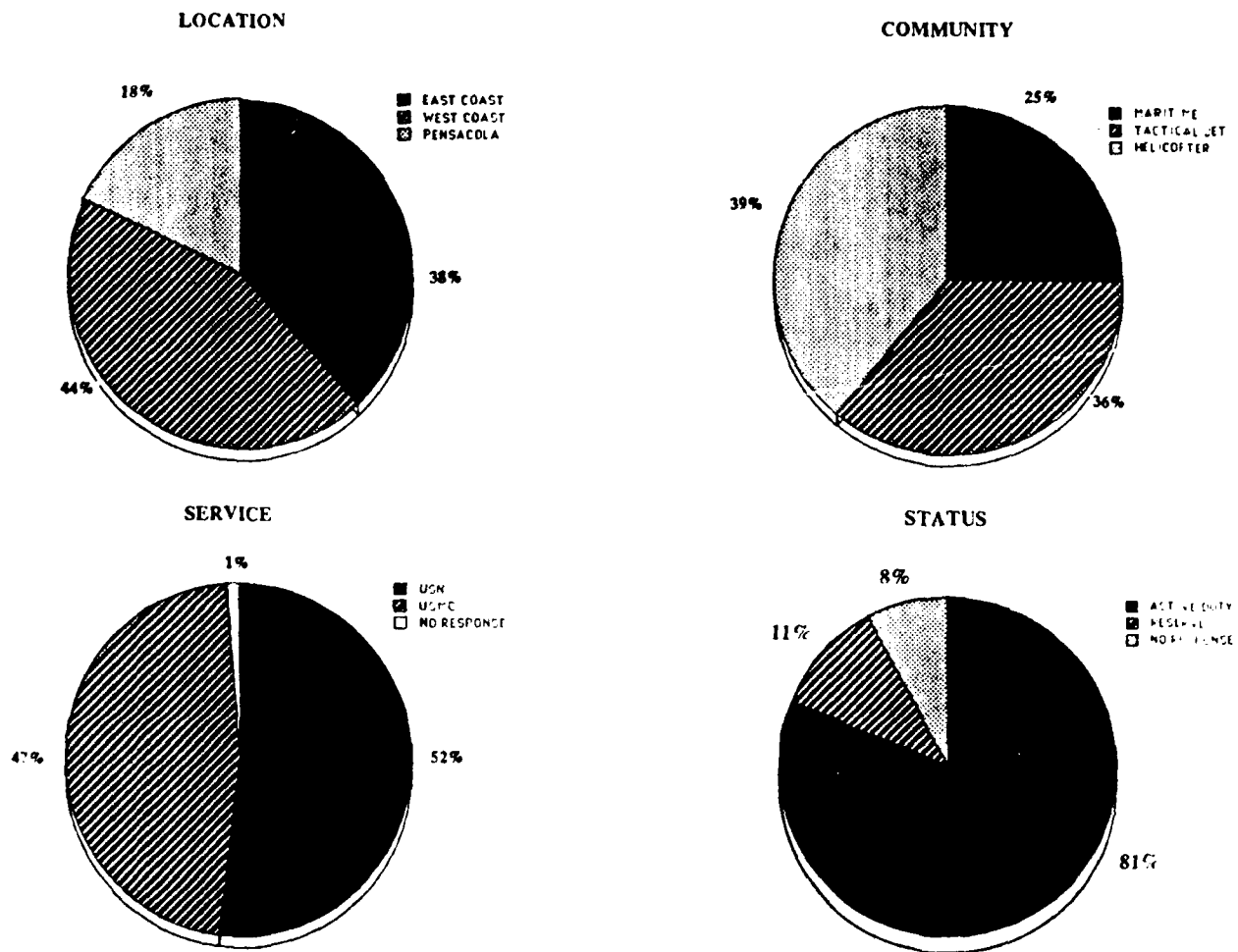


Figure 2. Demographic characteristics of survey respondents.

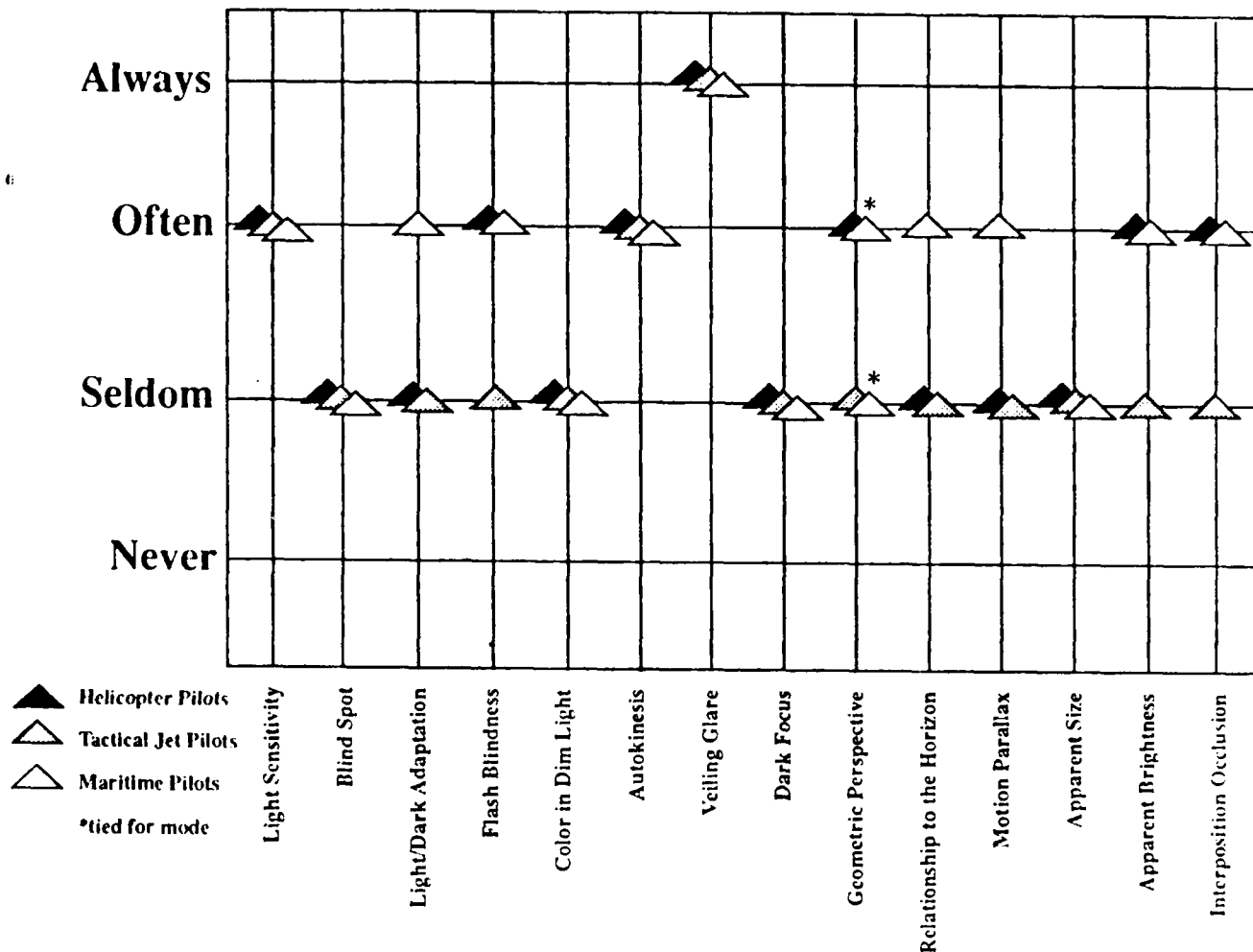


Figure 3. Overall mode response statistics calculated for each of the fourteen training topics, by aircraft community. (Data combined to include all operational scenarios except those identified as "For helicopter only".)

## Light Sensitivity

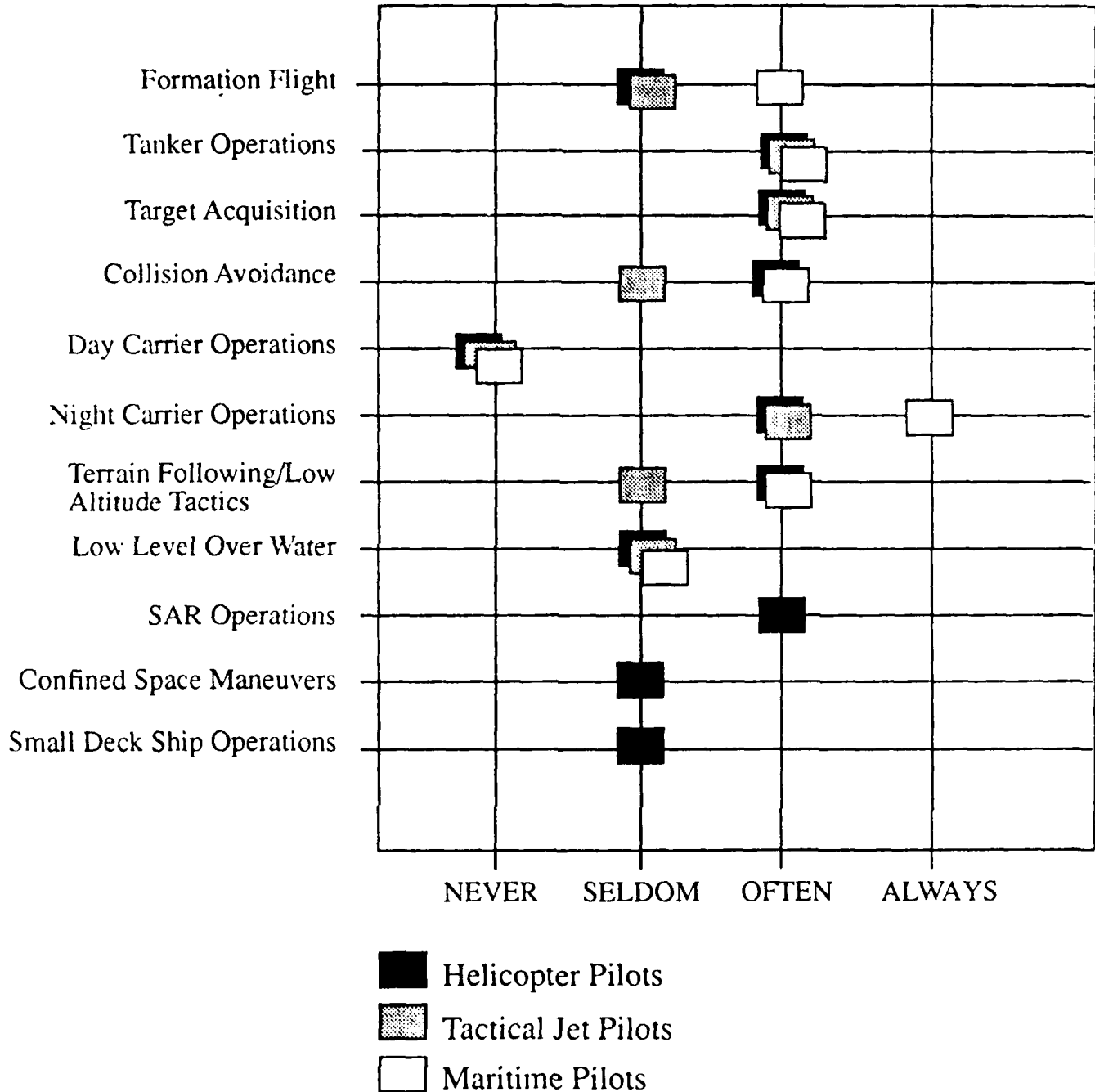


Figure 4. Mode response statistics calculated for items relating to the topic of "Light Sensitivity," by operational scenario and aircraft community.

## Blind Spot

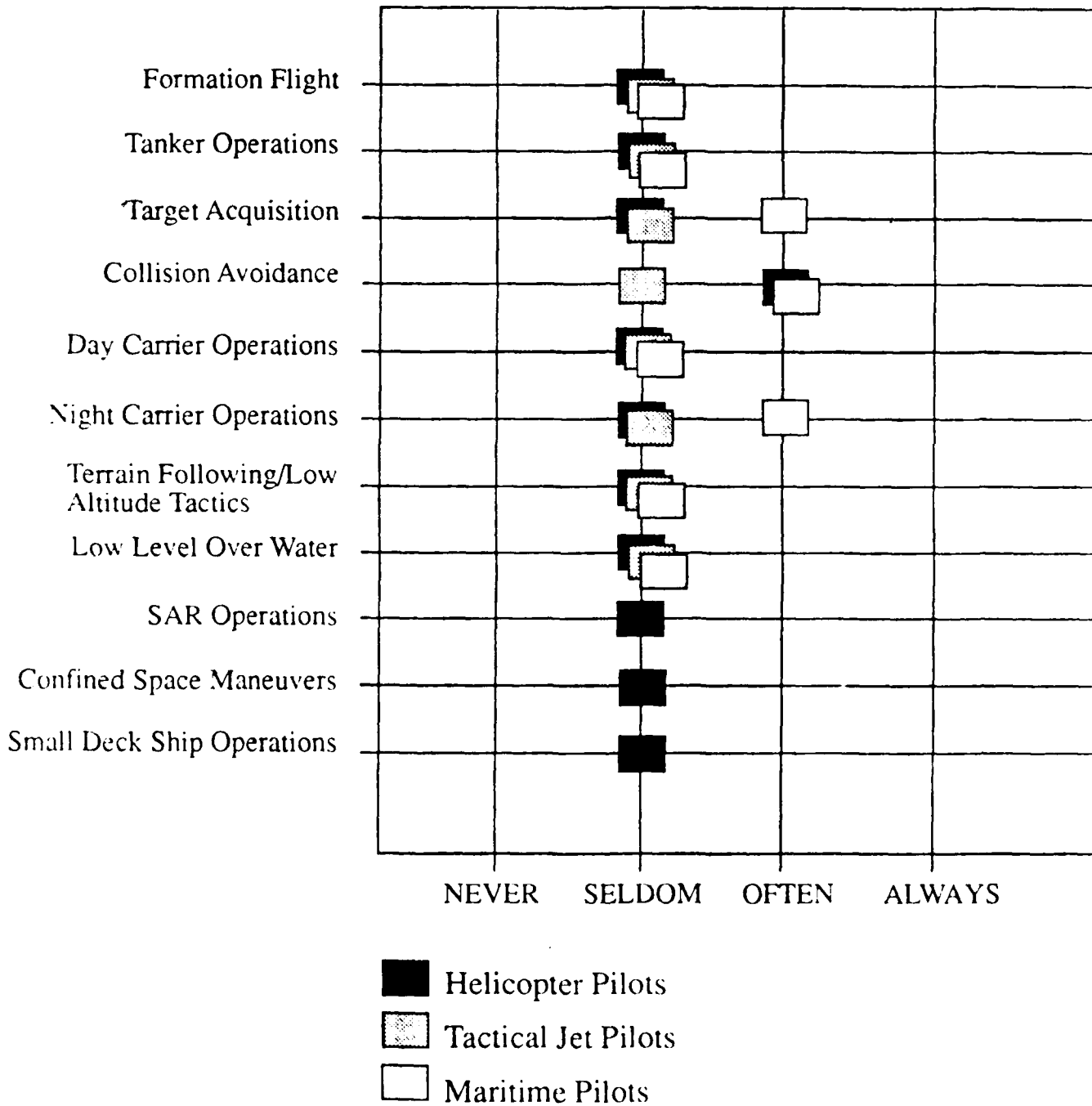


Figure 5. Mode response statistics calculated for items relating to the topic of "Blind Spot," by operational scenario and aircraft community.



## Light/Dark Adaptation

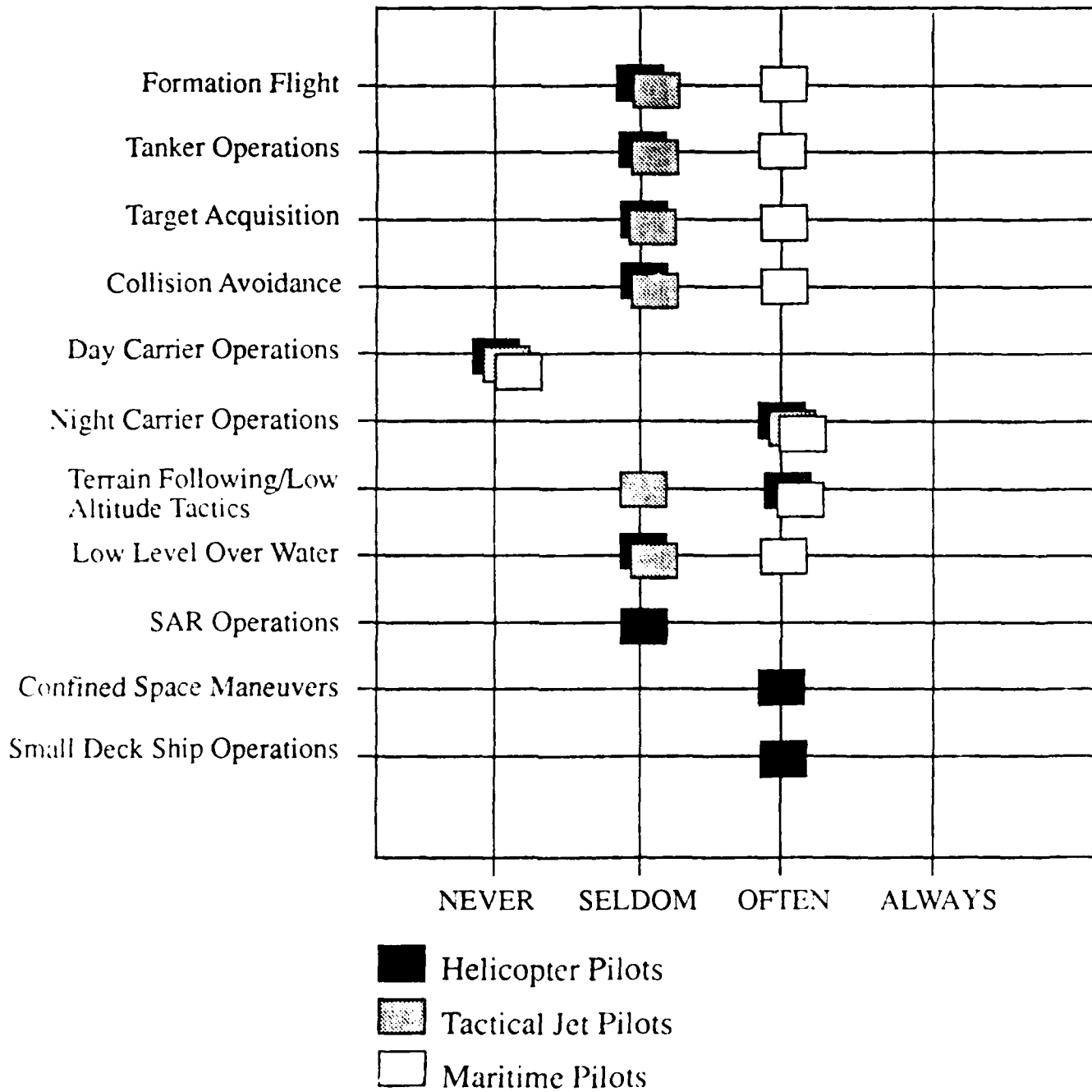


Figure 6. Mode response statistics calculated for items relating to the topic of "Light/Dark Adaptation," by operational scenario and aircraft community.

## Flash Blindness

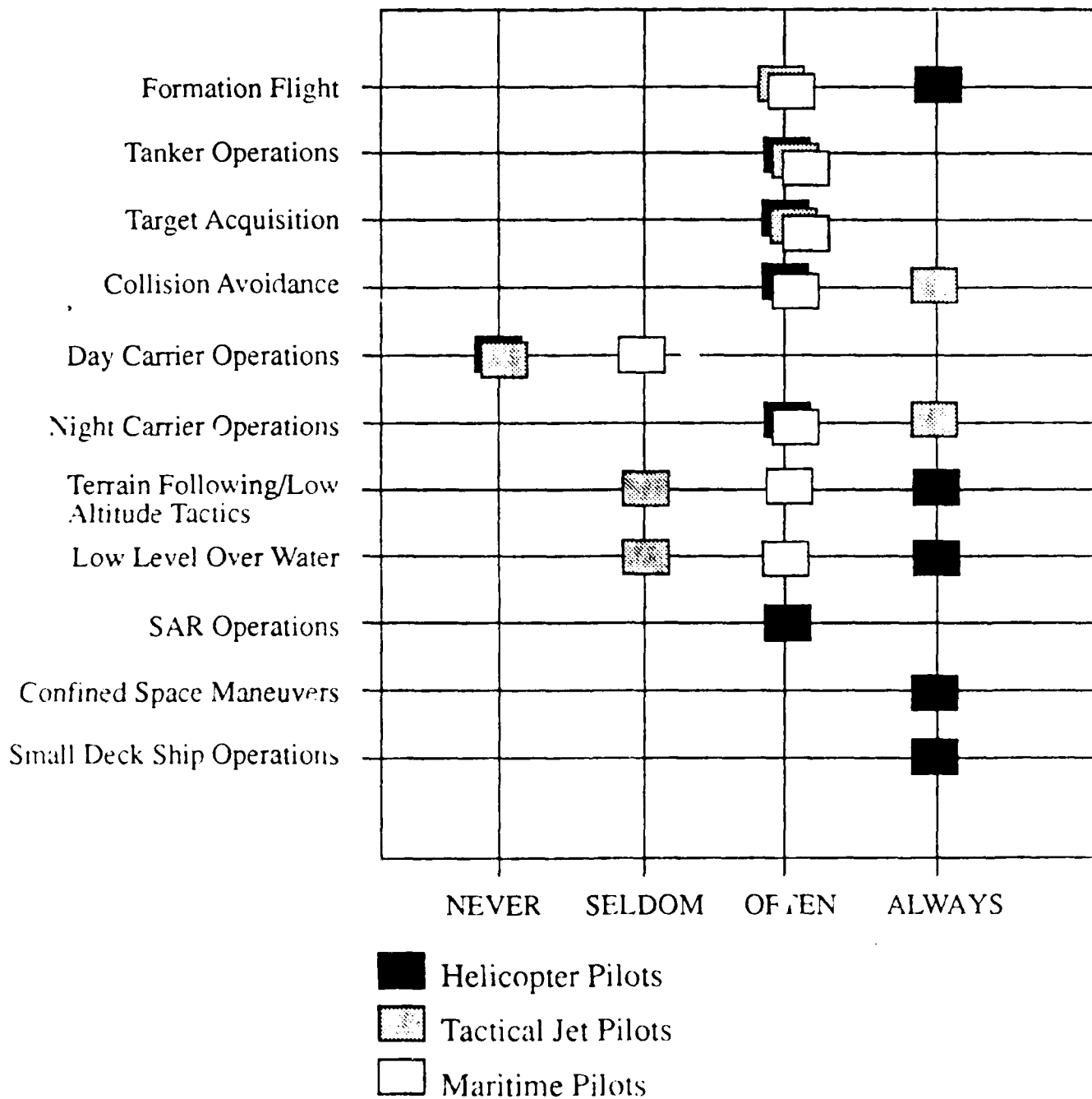


Figure 7. Mode response statistics calculated for items relating to the topic of "Flash Blindness," by operational scenario and aircraft community.

## Colors in Dim Light

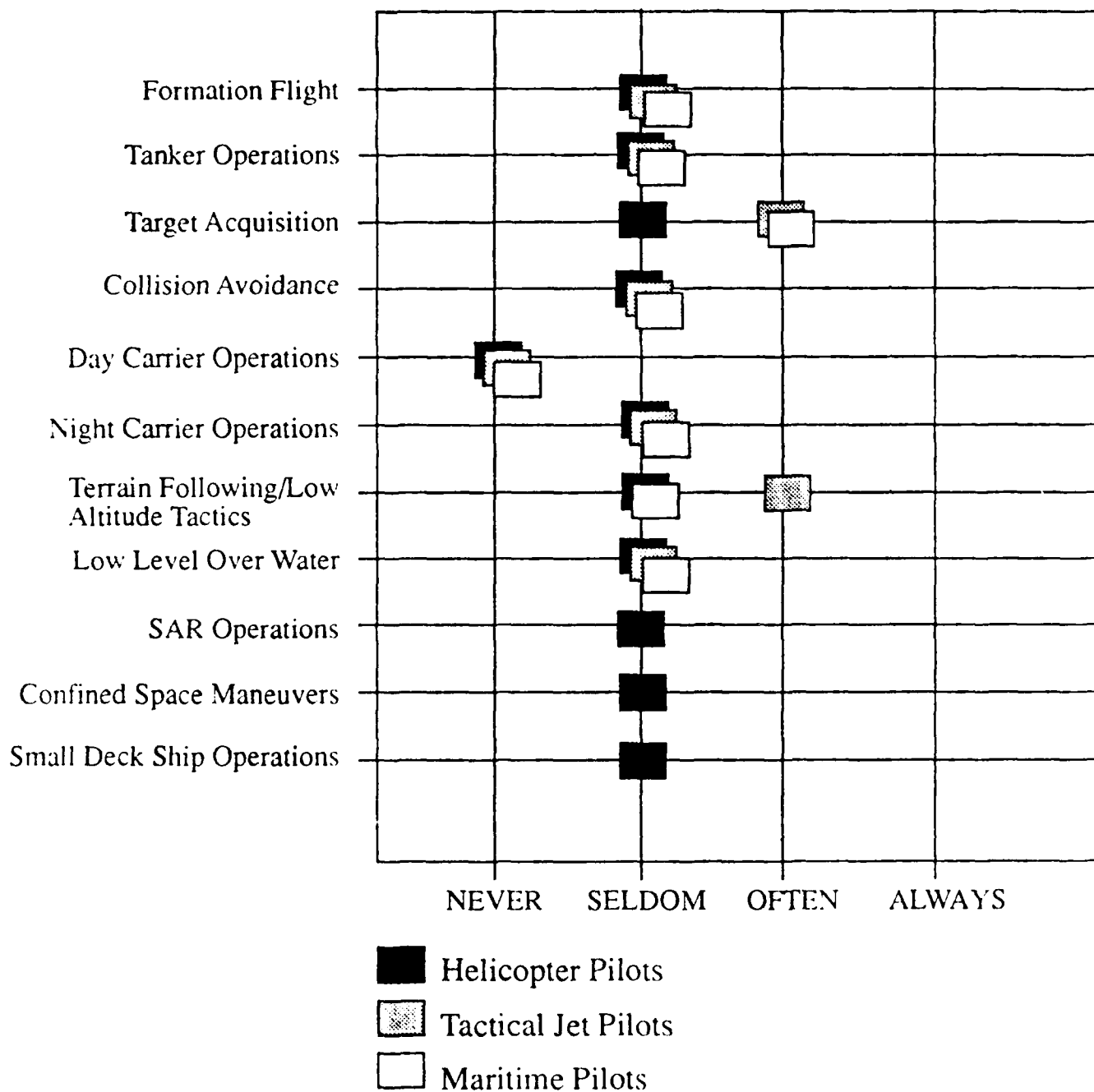


Figure 8. Mode response statistics calculated for items relating to the topic of "Colors in Dim Light," by operational scenario and aircraft community.

## Autokinesis

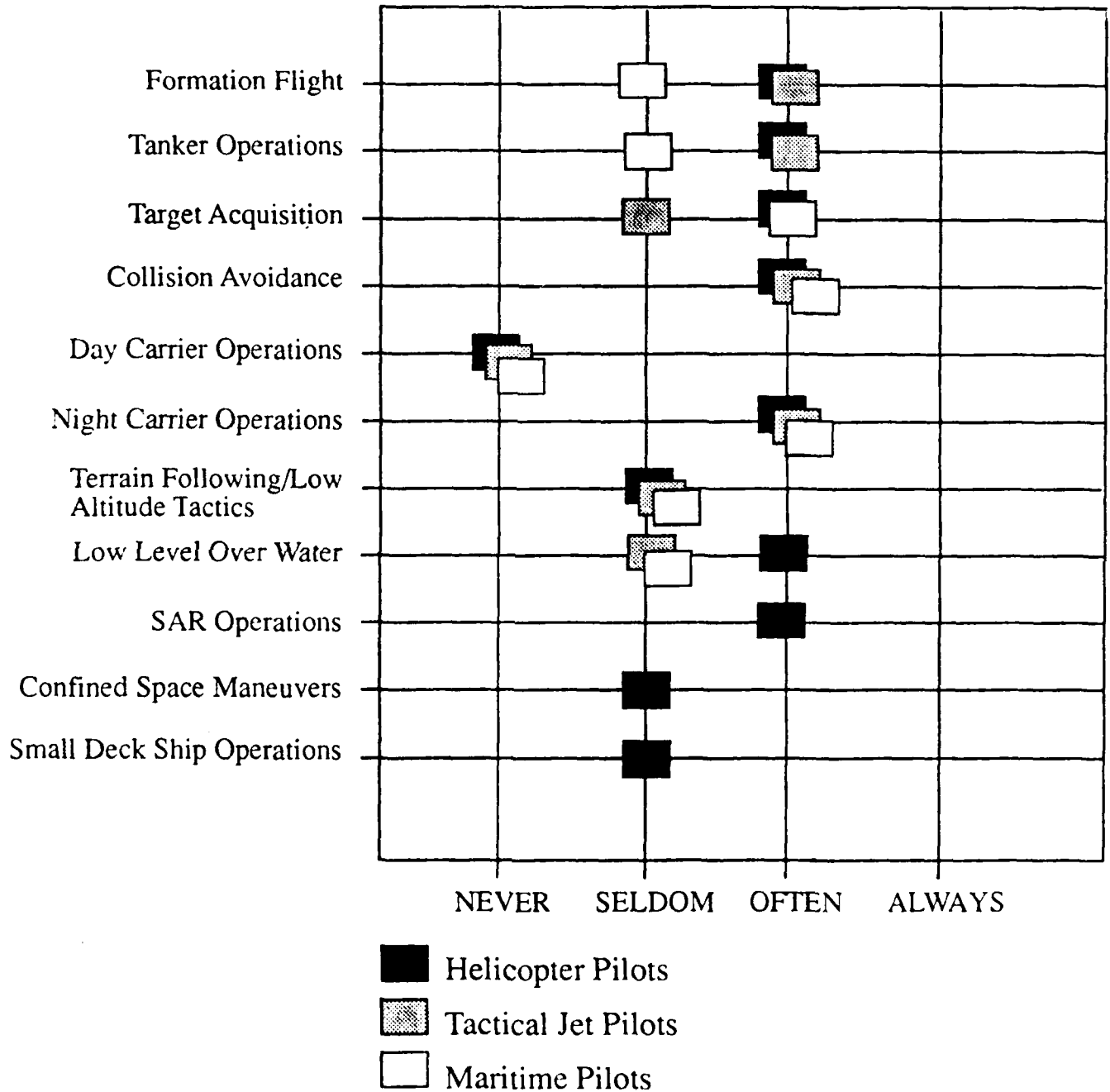


Figure 9. Mode response statistics calculated for items relating to the topic of "Autokinesis," by operational scenario and aircraft community.

## Veiling Glare

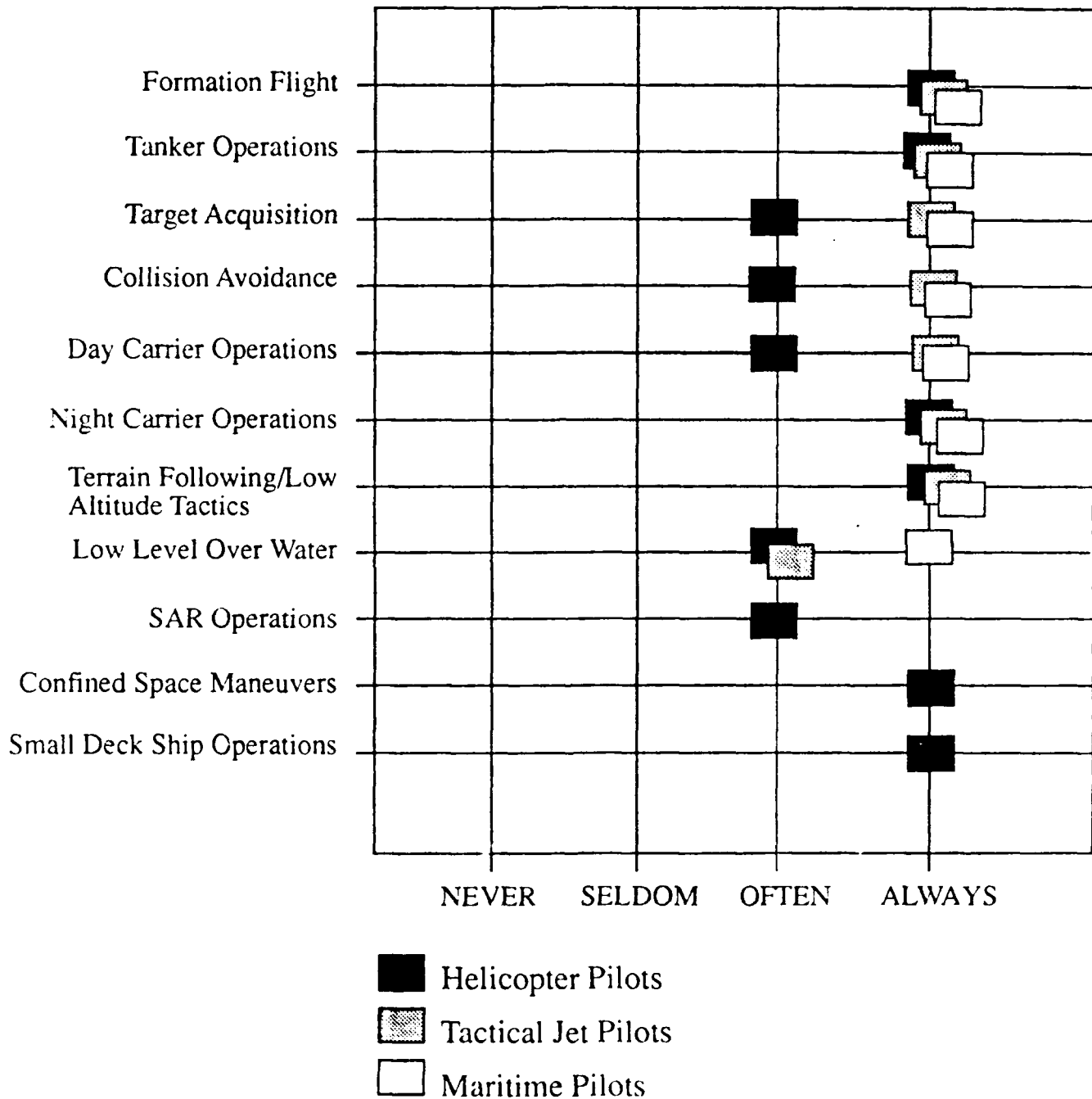


Figure 10. Mode response statistics calculated for items relating to the topic of "Veiling Glare," by operational scenario and aircraft community.

## Dark Focus

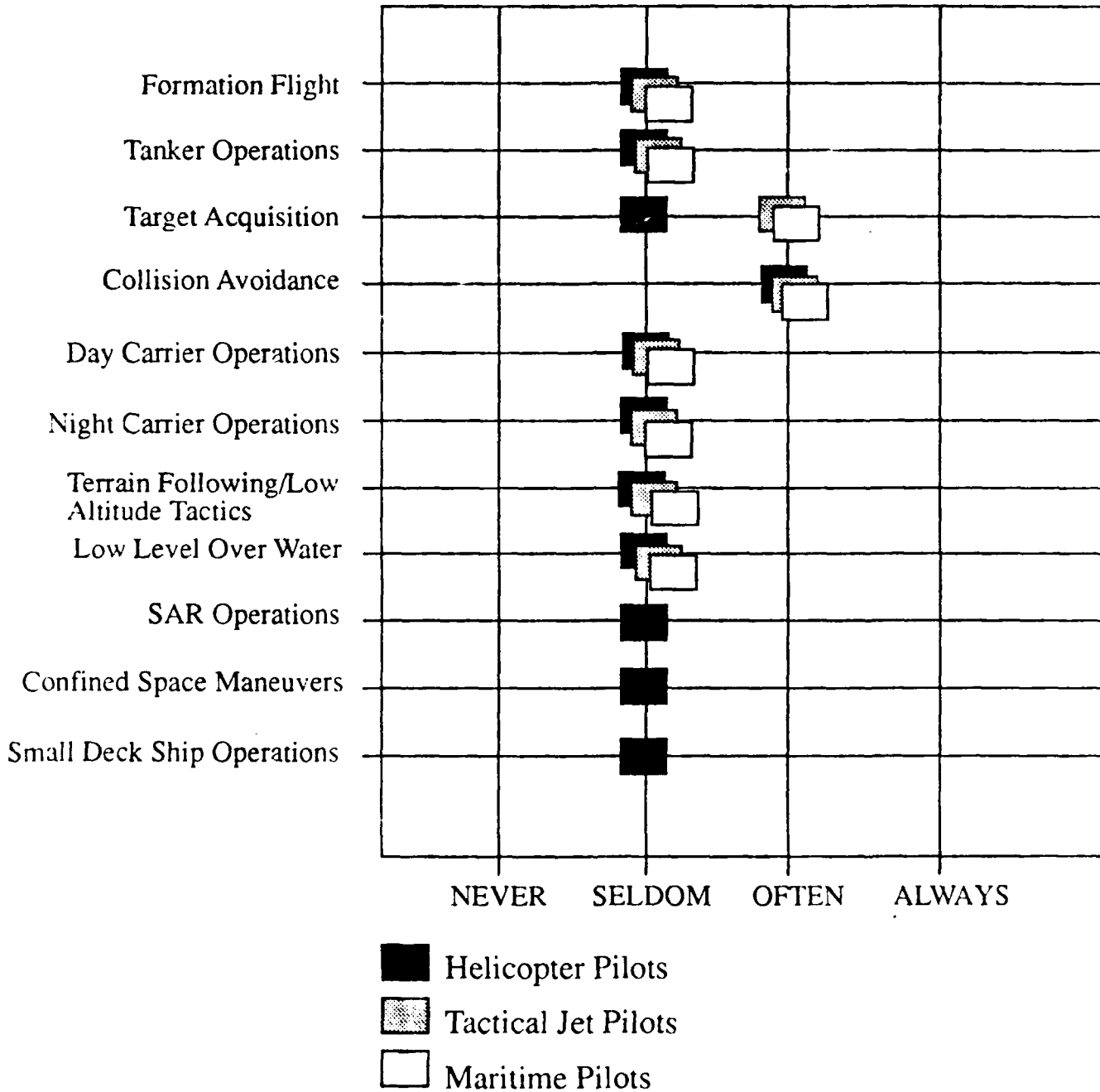


Figure 11. Mode response statistics calculated for items relating to the topic of "Dark Focus," by operational scenario and aircraft community.

## Geometric Perspective

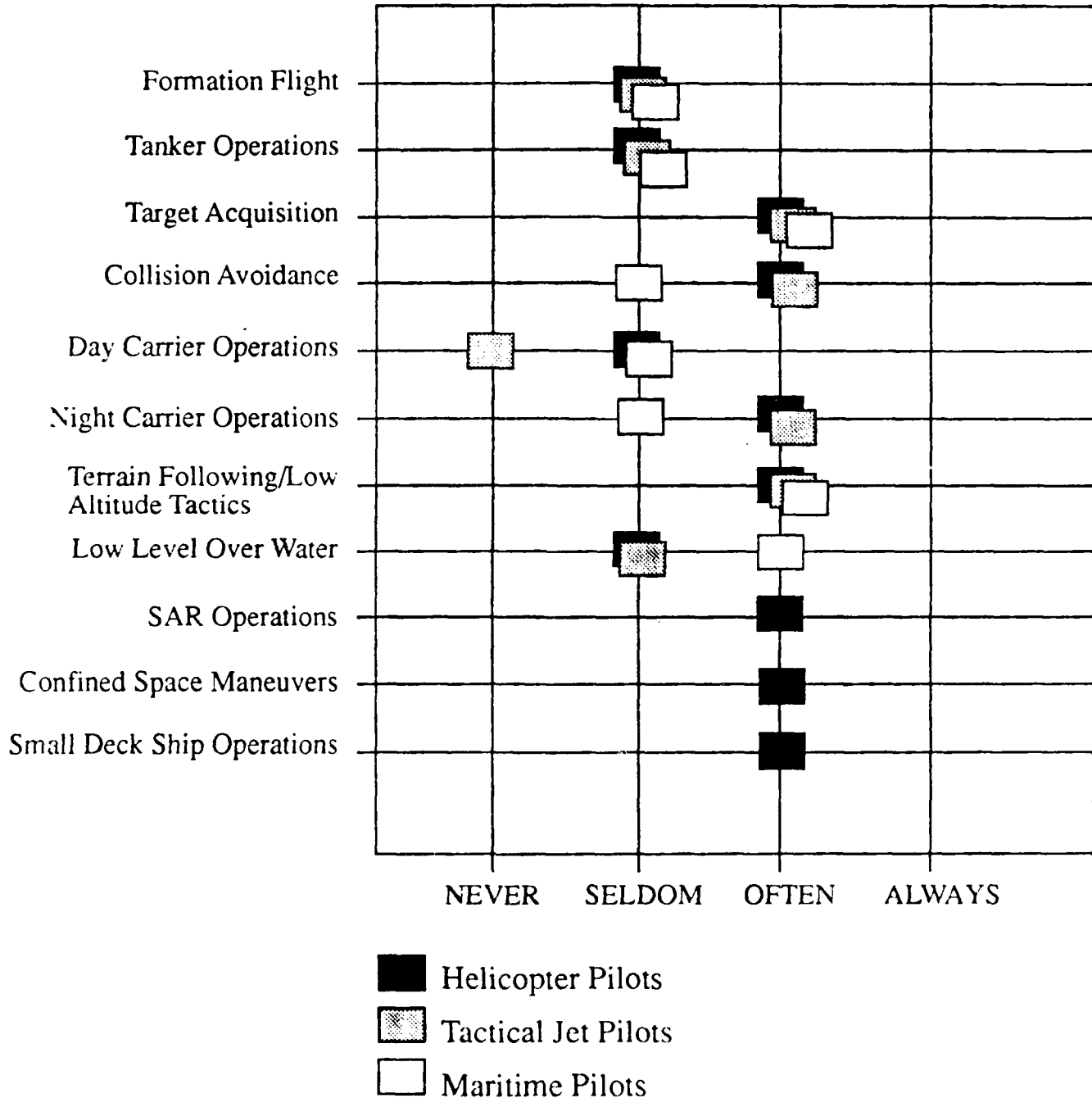


Figure 12. Mode response statistics calculated for items relating to the topic of "Geometric Perspective," by operational scenario and aircraft community.

## Relationship To The Horizon

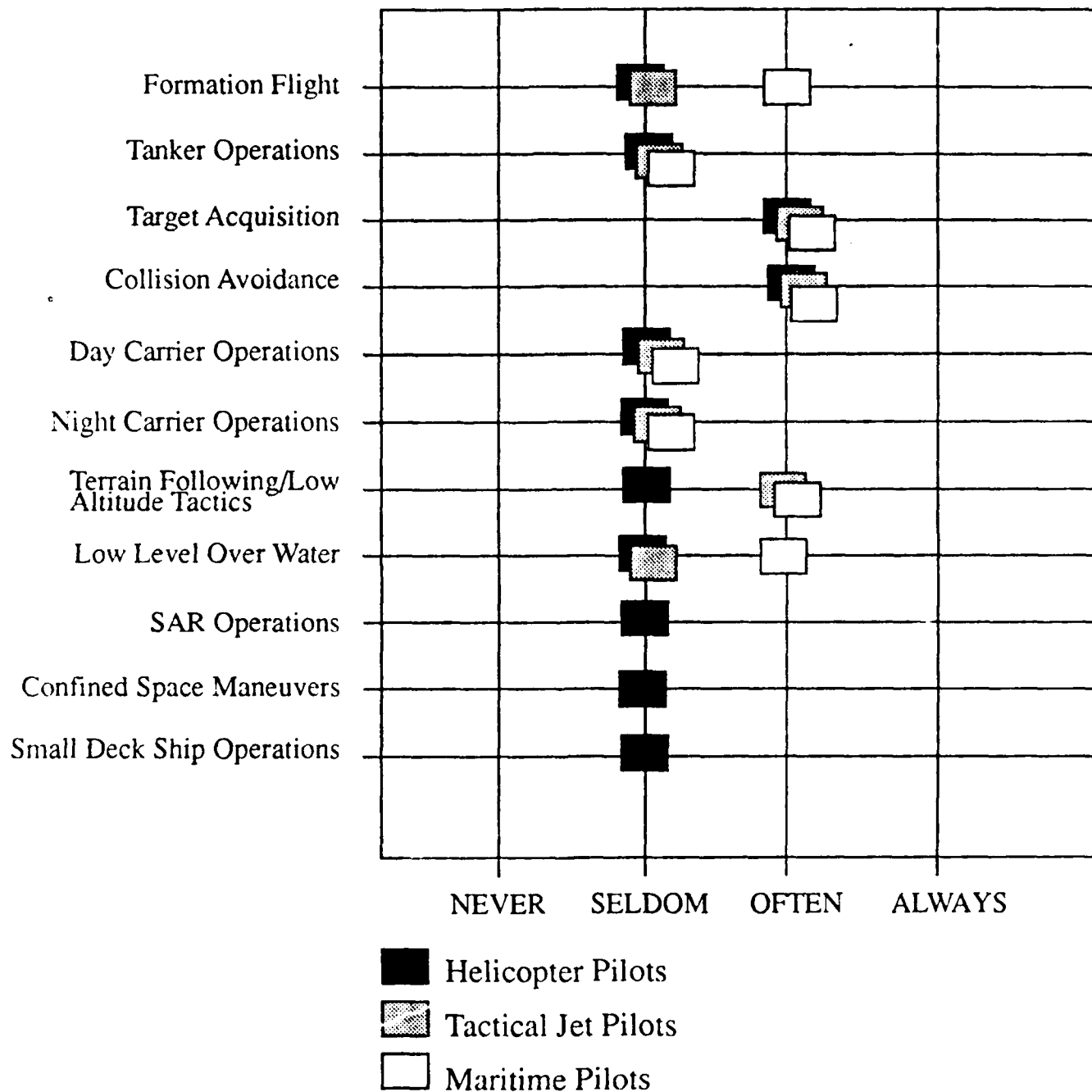


Figure 13. Mode response statistics calculated for items relating to the topic of "Relation to Horizon," by operational scenario and aircraft community.



## Motion Parallax

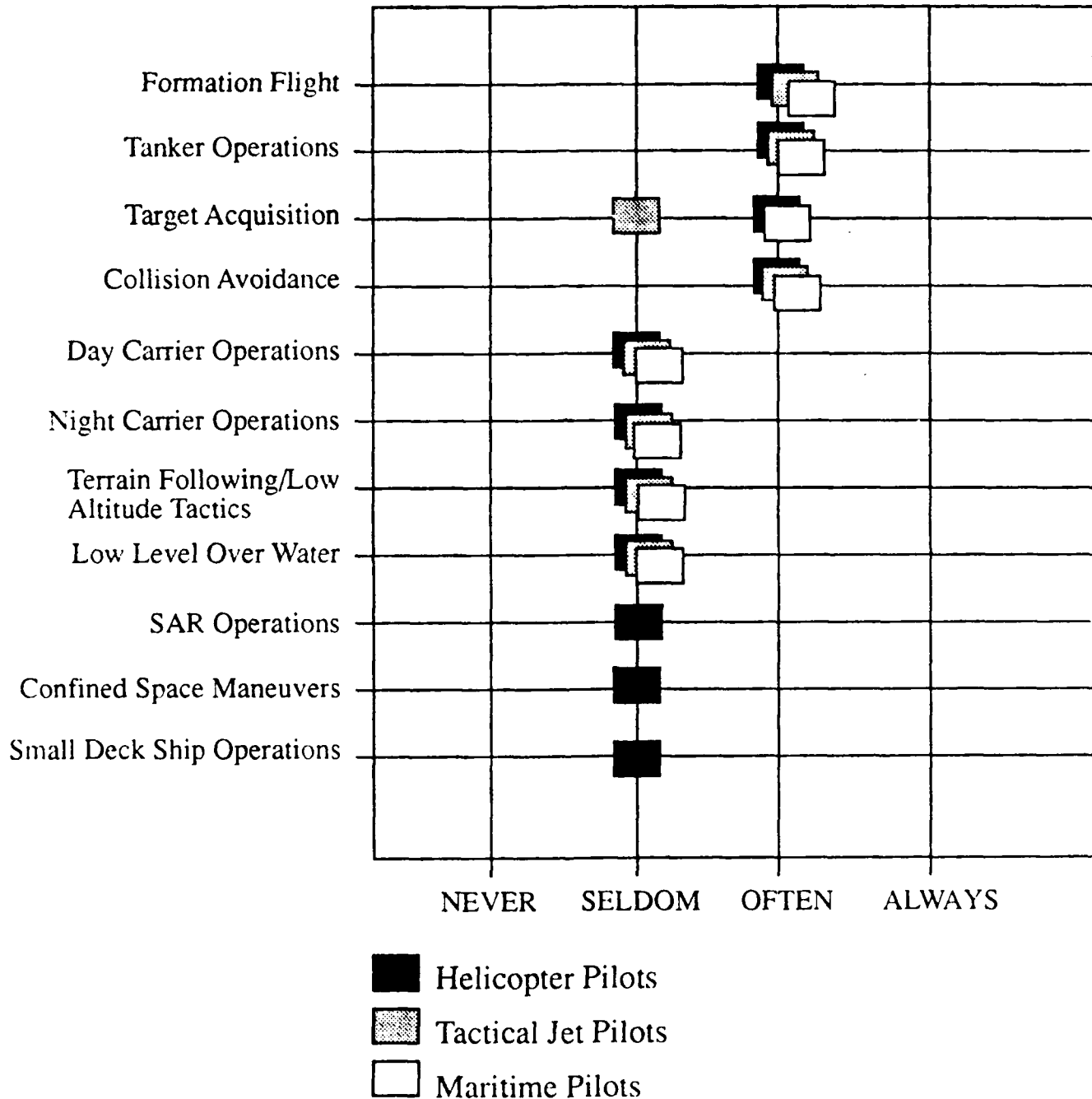


Figure 14. Mode response statistics calculated for items relating to the topic of "Motion Parallax," by operational scenario and aircraft community.

## Apparent Size

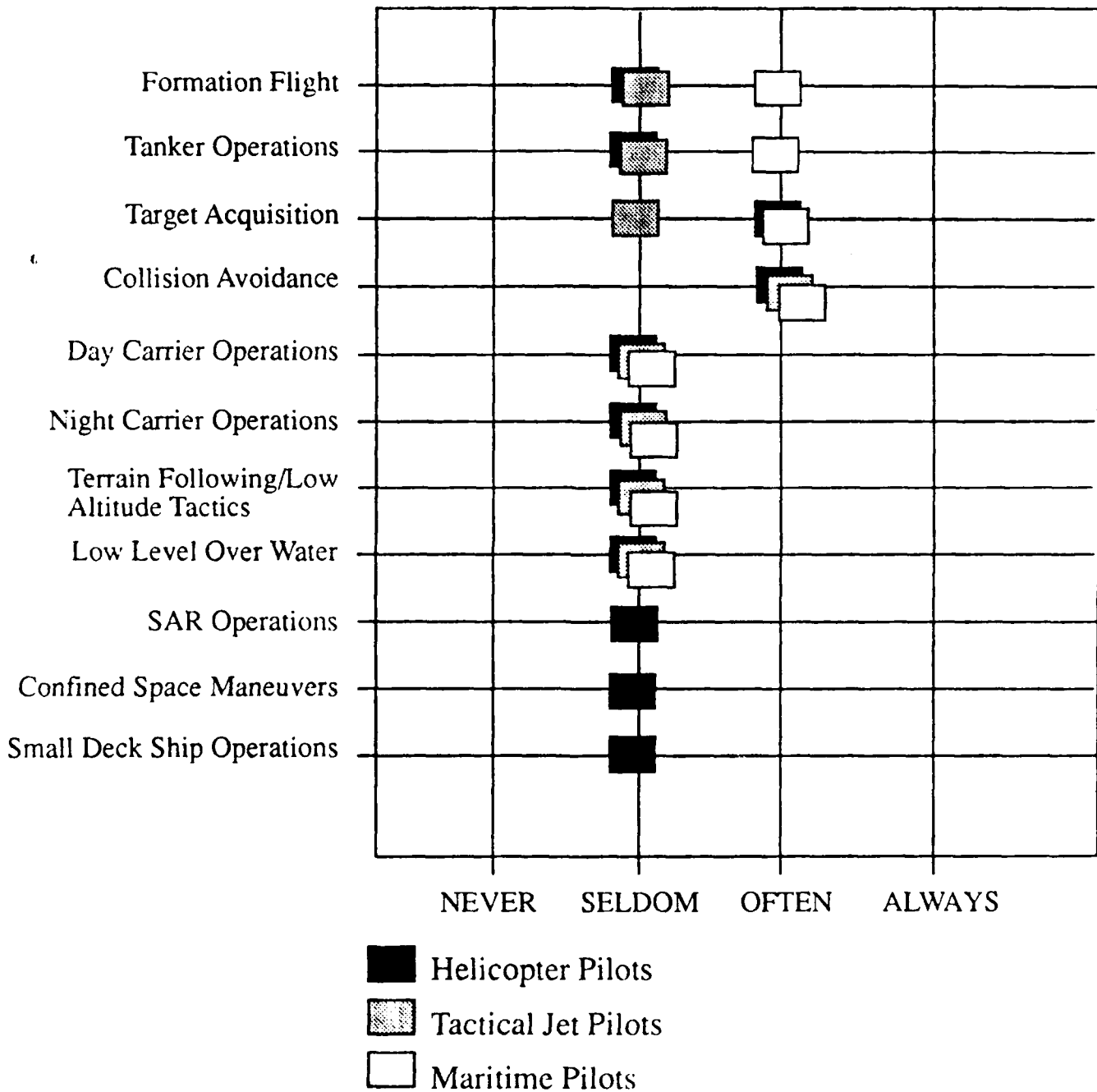


Figure 15. Mode response statistics calculated for items relating to the topic of "Apparent Size," by operational scenario and aircraft community.

## Apparent Brightness

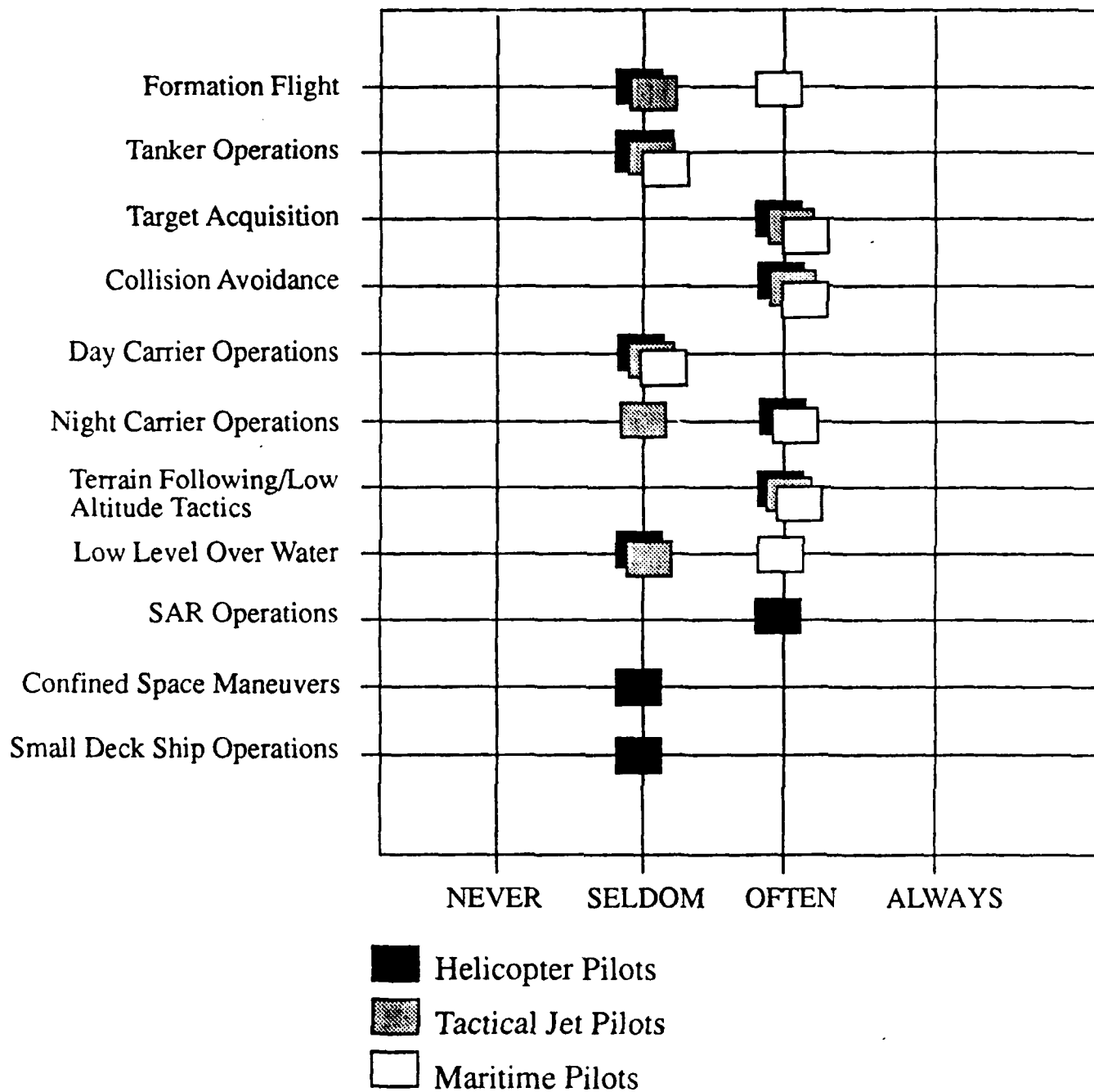


Figure 16. Mode response statistics calculated for items relating to the topic of "Apparent Brightness," by operational scenario and aircraft community.

## Overlay and Occlusion

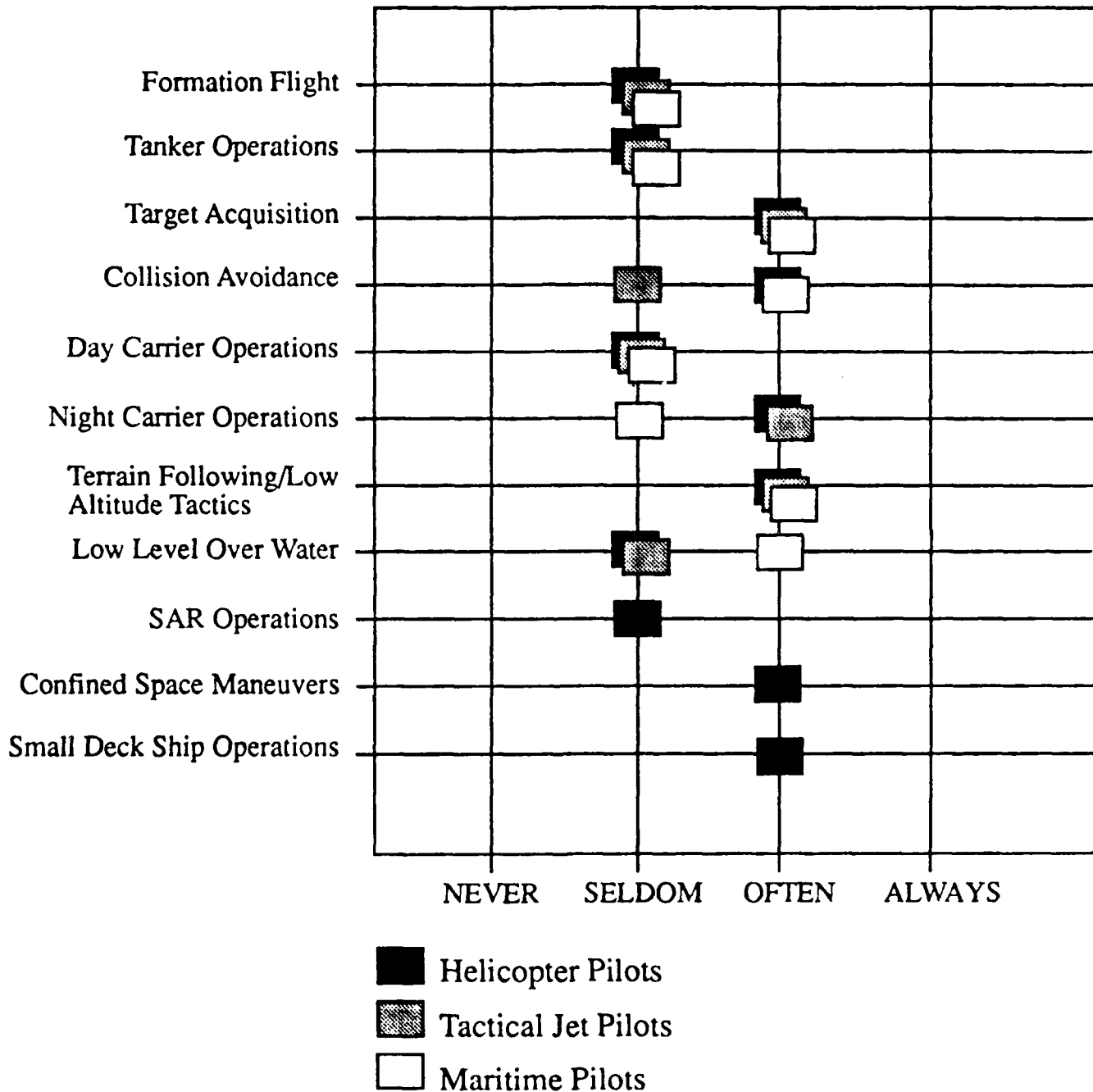


Figure 17. Mode response statistics calculated for items relating to the topic of "Overlay/Occlusion," by operational scenario and aircraft community.

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TABLE 2

Results of Kruskal-Wallis Analyses of variance among aircraft communities for specific operational scenarios within each training topic.

|                             | Formation Flight | Tanker Operations | Target Acquisitions | Collision Avoidance | Day Carrier Operation | Night Carrier Operations | Terrain Following/Low Altitude Tactics | Low Over Water | Total Significant Per Topic |
|-----------------------------|------------------|-------------------|---------------------|---------------------|-----------------------|--------------------------|--|----------------|-----------------------------|
| Light Sensitivity           |                  |                   |                     |                     |                       |                          | ●                                      |                | 1 of 7                      |
| Blind Spot                  | ○                |                   |                     | ○                   |                       |                          |  |                | 2 of 8                      |
| Light/Dark Adaptation       | ●                |                   |                     | ○                   |                       |                          | ●                                      | ●              | 4 of 8                      |
| Flash Blindness             |                  |                   |                     |                     |                       |                          | ○                                      | ●              | 2 of 8                      |
| Colors in Dim Light         |                  |                   |                     | ●                   |                       |                          |  |                | 1 of 7                      |
| Autokinesis                 | ○                | ○                 |                     |                     |                       | ○                        |  | ○              | 4 of 7                      |
| Veiling Glare               |                  |                   |                     |                     |                       |                          |  |                | 0 of 8                      |
| Dark Focus                  |                  |                   | ●                   |                     |                       |                          |  |                | 1 of 8                      |
| Geometric Perspective       |                  |                   |                     |                     |                       |                          |  |                | 0 of 8                      |
| Relationship to the Horizon |                  |                   |                     |                     |                       |                          |  |                | 0 of 8                      |
| Motion Parallax             | ○                |                   |                     |                     |                       | ○                        |  |                | 2 of 8                      |
| Apparent Size               | ●                |                   |                     | ○                   |                       | ●                        |  |                | 3 of 8                      |
| Apparent Brightness         |                  |                   |                     |                     |                       |                          |  |                | 0 of 8                      |
| Overlay and Occulsion       |                  |                   |                     | ○                   |                       | ○                        |  |                | 2 of 8                      |
| Total Significant           | 5                | 1                 | 1                   | 5                   | 0                     | 4                        | 3                                      | 3              | 22 of 109                   |

● = PR < .01

○ = PR < .05

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## DISCUSSION

None of the 14 training topics were regarded as NEVER a problem for operational flying. Figure 3 plots modal tendencies for overall responses for each of the three communities. Three ALWAYS, 16 OFTEN, 22 SELDOM and one OFTEN/SELDOM tie statistics are apparent. The absence of extreme negative ratings would seem to endorse the long held assumptions regarding the real world value of training pilots to recognize and avoid the discussed visual deficiencies.

A reasonable criticism of this finding might emphasize the negative connotation of the "NEVER" rating option. The inclusion of a highly biased choice was intended to call out extreme opinions on the part of the rater. None were revealed in these data. Furthermore, the connotation may not have been as inhibiting for the pilot community which is often regarded as more outspoken than the general population.

Such an extreme positive rating was obvious with the topic of Veiling Glare. In addition to the overall modes, 21 individual operational scenarios obtained ALWAYS ratings. The remaining six were rated OFTEN. This concern for high luminance conditions was further apparent in the results for the topic of Flash Blindness where the overall aircraft community modes were OFTEN and SELDOM. A closer look at the individual scenarios indicates that ALWAYS and OFTEN were obtained in 22 of the statistics and that three of the remaining five NEVER and SELDOM ratings were obtained for the illogical scenario of Day Carrier Landings.

The topic of Dark Focus obtained modes of SELDOM in all three overall community modes as well as in 22 individual scenarios modes. Appropriately, the scenarios of Target Acquisition and Collision Avoidance achieved OFTEN. The sampled pilots appear to have sufficient appreciation for the visual deficiency, yet still rate its importance for operational flying relatively low.

Finally, the differences among communities were examined. Results of nonparametric analyses of variance indicate that 22 of the possible 109 logical scenarios were significantly different. The practical value of understanding this is not entirely obvious. Although the total number of analyses achieving significance is beyond chance, none of the topics obtained consistently significant differences across more than four operational scenarios. The most consistent differences were in the topics of Autokinesis and Light/Dark Adaptation. Differences in four of seven logical scenarios were apparent for Autokinesis. Similarly only four of eight were obtained for Light/Dark Adaptation. These findings fail to indicate need for tailoring training to specific aircraft communities.

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CONCLUSION

This effort revealed four findings worthy of further consideration. Briefly summarized from the above, they include:

- \* Evidence of fleet acceptance for each of the surveyed aviation physiology vision training topics.

- \* Strong indication of appreciation for operational problems associated with high luminance environments (i.e., Veiling Glare and Flash Blindness).

- \* Evidence of acceptance, with limited concern, for the importance of the heavily researched topic of Dark Focus.

- \* Very limited indication of differential concern for the surveyed topics, among helicopter, tactical and maritime communities.

These data provide initial information. Actions to improve current Naval Aviation Physiology training should be attempted concurrent with further evaluations. The ratings obtained for Veiling Glare and Flash Blindness topics are worthy of immediate attention. Present unaided vision lectures could be augmented with additional information regarding extreme luminance conditions which might include a flash blindness training device.

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### COORDINATION

This was a joint research project involving both the Naval Training Systems Center and the Naval Aerospace Medical Institute. Numerous fleet aviation physiology instructors were involved in data collection. The Aviation Training Model Manager at the Naval Aerospace Medical Institute, LCDR William Little, (904-452-4705) cooperated as both the final recipient of this information and as a co-author of this report. LCDR Little and the Aviation Physiology Training community are responsible for initial and refresher training of aviators in the Navy and Marine Corps. Continued benefits for both military and civilian aviation are enhanced by recent Office of Naval Research funding for continued work in this area.

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APPENDIX A

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# BASIC VISION TOPICS

## FLEET OPINION QUESTIONNAIRE

## INTRODUCTION

The purpose of the following questionnaire is to collect input regarding the importance of basic vision problems. Each page describes a specific vision concern, then requests your expert opinion to determine its importance across a variety of operational conditions. This information will be used to modify vision lectures to ensure the greatest possible level of operational relevance.



How long have you been flying?

☐ Initial Training

☐ 1-5 Years

☐ 6 Or More Years

What community do you typically fly with?

☐ Maritime

☐ Tactical Jet

☐ Helicopter

☐ To Be Determined

What crew category do you fly as?

☐ Pilot

☐ NFO

☐ Aircrew

☐ Special Crew

☐ To Be Determined

Approximately how many hours have you flown? \_\_\_\_\_

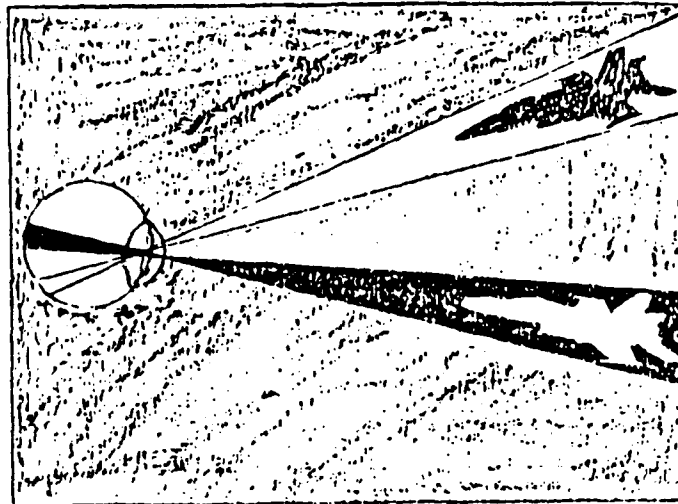
What aircraft do you typically fly? \_\_\_\_\_

Approximately how many hours? \_\_\_\_\_

Are you: ☐ Navy ☐ Marine Corps?

Are you: ☐ Active Duty ☐ Reserve?

## LIGHT SENSITIVITY



The light sensitive portion of the eye has two types of receptors, cones and rods. Cones see the world in color and are sensitive to both large and relatively small detail. In comparison, rods see only black, white and shades of gray. They are not as sensitive to small detail but require less light to operate. Most of the cones are found in the center of the retina. The rods are located in the surrounding areas. The center of the retina is, therefore, not sensitive to dim light because the cones require more light. The resulting "night blind spot" is often ignored.

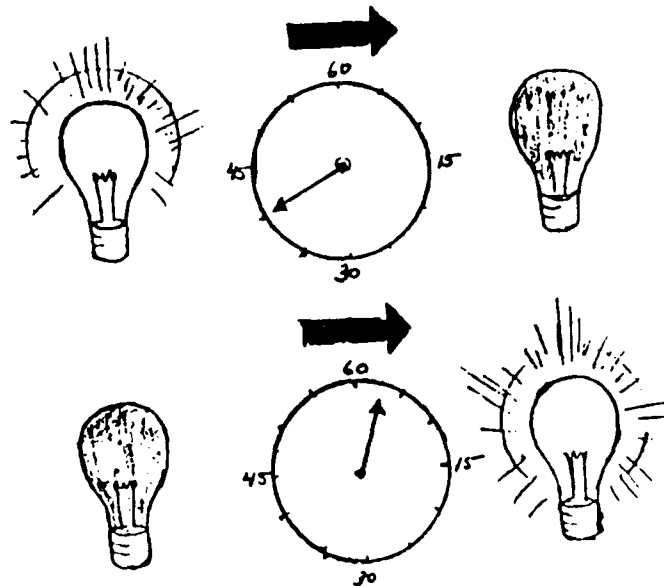
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| FORMATION FLIGHT                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TANKER OPERATIONS                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TARGET ACQUISITION                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| COLLISION AVOIDANCE                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| DAY CARRIER OPERATIONS                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NIGHT CARRIER OPERATIONS               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| LOW LEVEL OVER WATER                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SAR OPERATIONS*                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CONFINED SPACE MANEUVERING*            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| SMALL DECK SHIP OPERATIONS*            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

\*Helicopter aviators only

# LIGHT/DARK ADAPTATION



Your eyes may require more than 30 minutes to adapt to a dark environment. Readaptation to lighter conditions usually occurs very quickly.

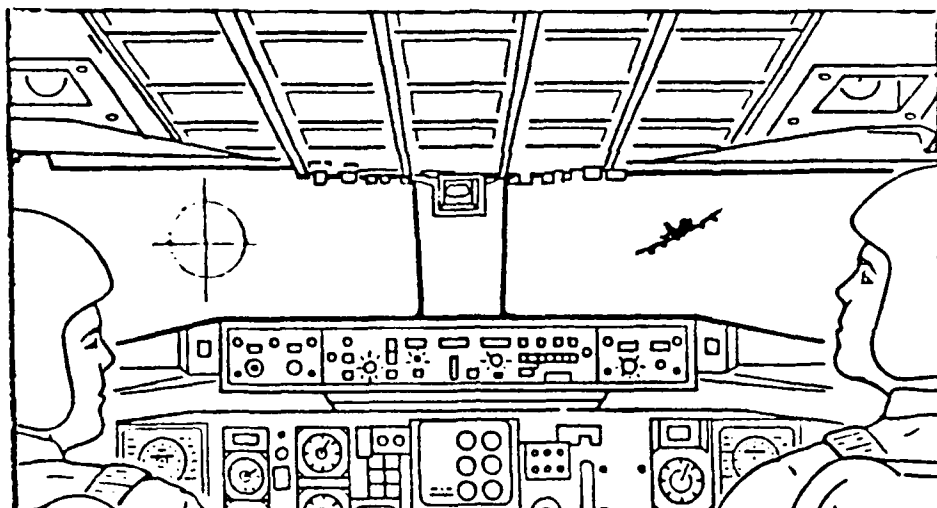
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# BLIND SPOT



Cover you left eye. Concentrate on the  while moving the picture in and out to locate your blind spot.

The area where the optic nerve passes through the retina is totally insensitive to light. This blind spot is in a slightly different place for each eye and is not obvious because views from opposite eyes overlap. Occasionally problems may occur when the view of one eye is inadvertently blocked.

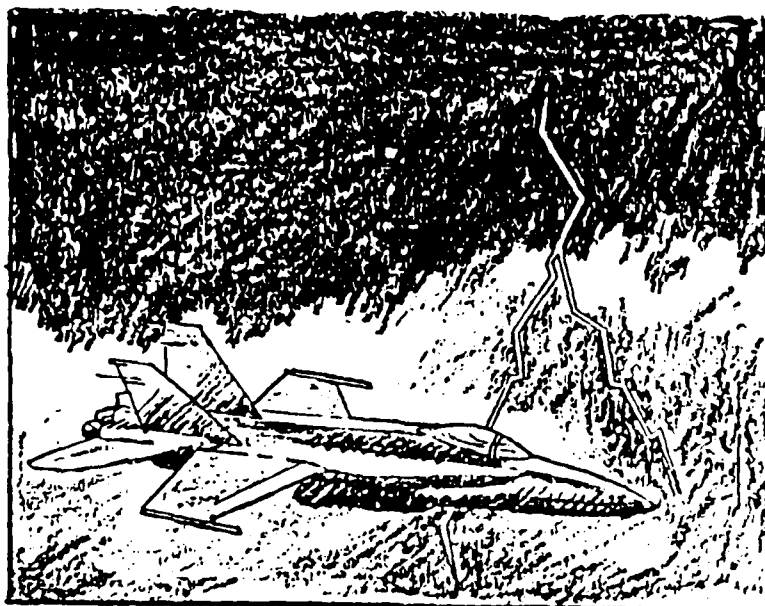
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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## FLASH BLINDNESS



Readapting to the dark following brief exposure to bright light often occurs more quickly than initial adaptation. Depending on the duration and intensity of the flash, there will be a period of initial blindness followed by diminished vision during the readaptation cycle.

When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# COLORS IN DIM LIGHT



Colors become increasingly difficult to identify as the cones become insensitive in dim light. Following slow adaptation, the eye becomes relatively more sensitive to blue rather than to other colors of light. Low light visual environments are essentially void of color.

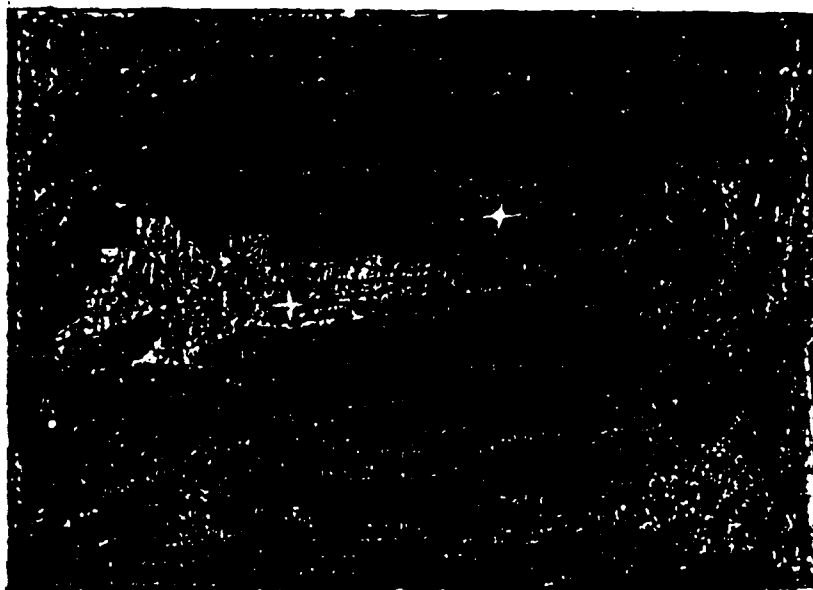
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# AUTOKINESIS



Small, point light sources often appear to drift or move if found in an otherwise dark environment. The explanation for this is complicated and not fully understood but it seems to occur only for small relatively isolated point light sources.

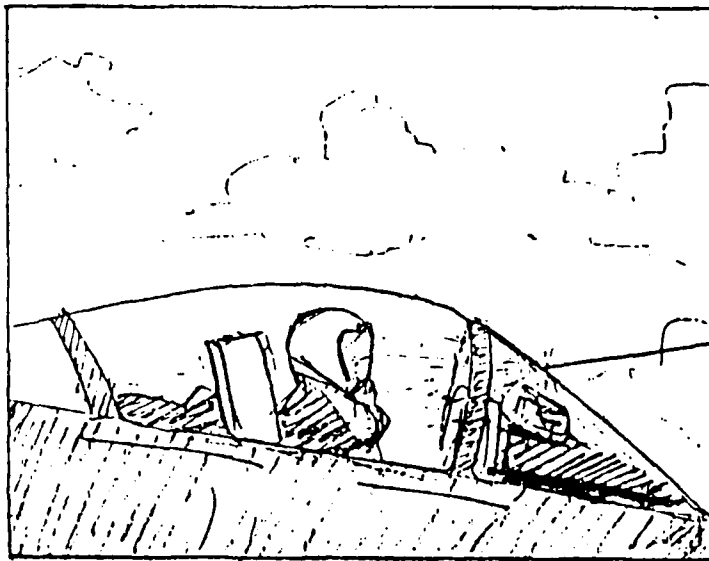
When, in your opinion, would this be a real problem for operational flying?

ALWAYS OFTEN SELDOM NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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## VEILING GLARE



The ability to adequately identify and maintain contact with the outside environment may be diminished with glare produced by bright light sources. Very bright light, such as a laser beam, may disperse upon striking the canopy and totally eliminate visual contact with the world beyond the cockpit.

When, in your opinion, might this be a real problem for operational flying?

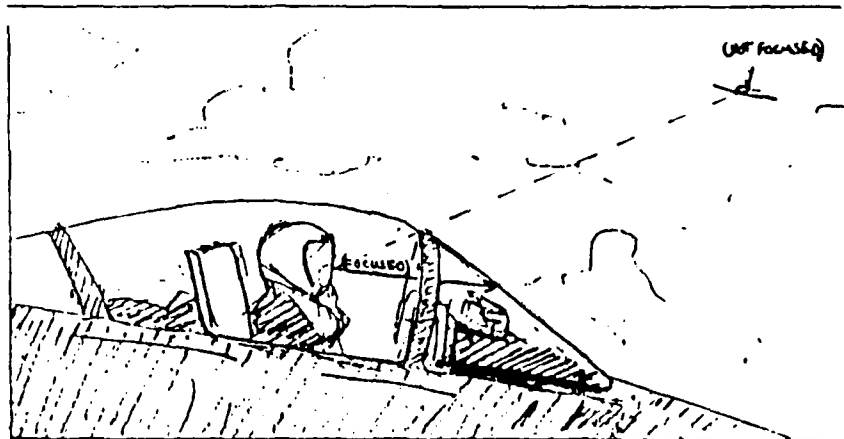
ALWAYS    OFTEN    SELDOM    NEVER

|                             |     |     |     |     |
|-----------------------------|-----|-----|-----|-----|
| FORMATION FLIGHT            | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS           | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION          | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE         | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS      | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS    | [ ] | [ ] | [ ] | [ ] |
| NAP-OF-THE-EARTH            | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER        | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*             | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING* | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS* | [ ] | [ ] | [ ] | [ ] |

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## DARK FOCUS



The muscles which focus the eye tend to relax to a resting position when there is little or nothing of interest in the visual environment. This relaxed focus, which is often only about a meter in front of the eye, may result from dark, IFR or severe clear conditions frequently encountered in routine flight operations. Unimportant stimuli which occur at the same distance as the resting focus may further serve to trap an aviators focus at an undesired distance. Scratches on the windscreen, for example, may combine with the natural tendency to shift to a near resting focus and insidiously reduce ones ability to see the environment beyond the cockpit.

When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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## **DISTANCE CUES**

Maintaining appropriate orientation in space requires a number of important visual cues that are not always available in routine flight operations. Distance cues are particularly important for aviation. Some of the more important visual cues include:

**GEOMETRIC PERSPECTIVE.**

**RELATIONSHIP TO THE HORIZON.**

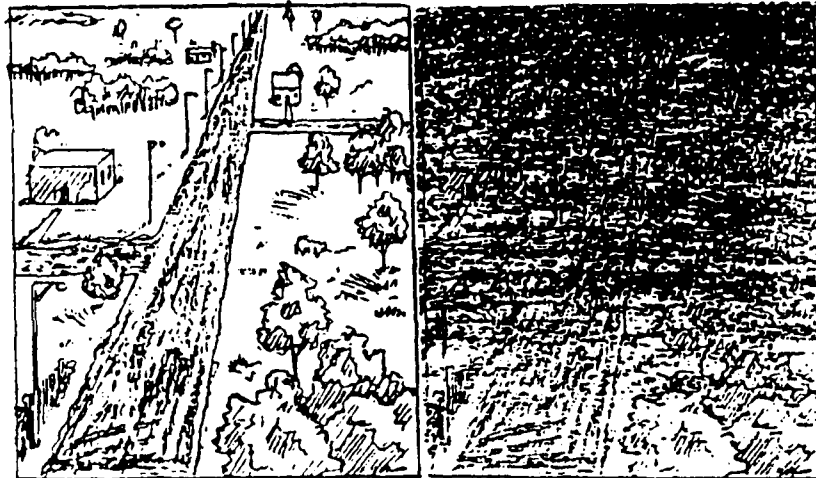
**MOTION PARALLAX.**

**APPARENT SIZE.**

**APPARENT BRIGHTNESS.**

**INTERPOSITION & OCCLUSION.**

# GEOMETRIC PERSPECTIVE



Converging lines, greater density and finer texture suggest greater distance than diverging lines, and less densely packed scenes with fewer details. Many environmental and situational conditions alter these natural cues. Since visual ability generally declines with darkness, less detail is available at night and distance is more difficult to estimate.

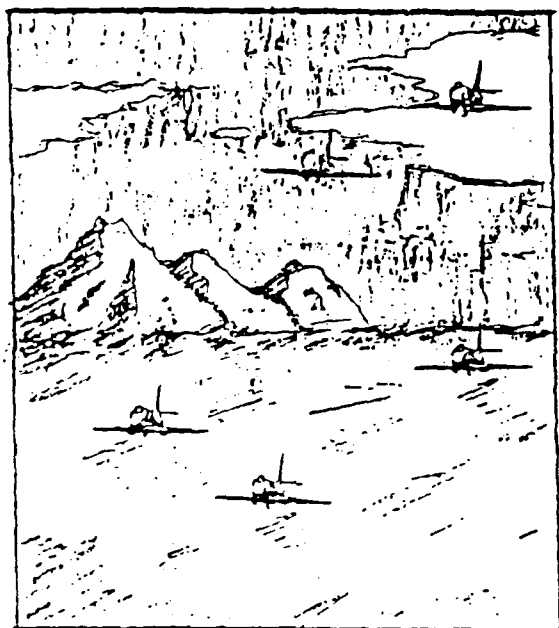
When, in your opinion, would this be a real problem for operational flying?

ALWAYS OFTEN SELDOM NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# RELATIONSHIP TO THE HORIZON



Usually things closer to the horizon appear more distant than those lower in the field of view. This perception may be incorrect for aerial targets or for targets viewed from the air. At times the horizon may not be visible. Cloud layer boundaries may present very convincing false horizons.

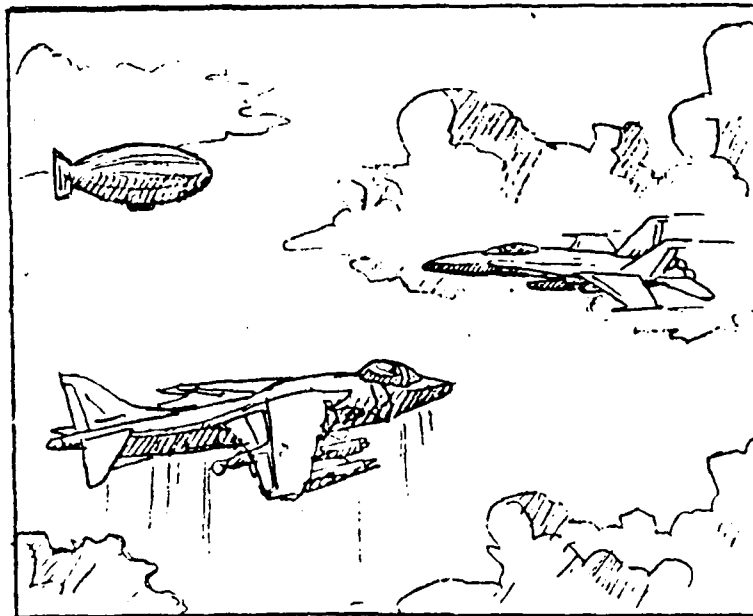
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# MOTION PARALLAX



Closer objects usually appear to shift more quickly, relative to the observers movements than more distant objects. Three dimensional movement, unusual speeds or unusual size of aerial reference points may make this information more difficult to interpret.

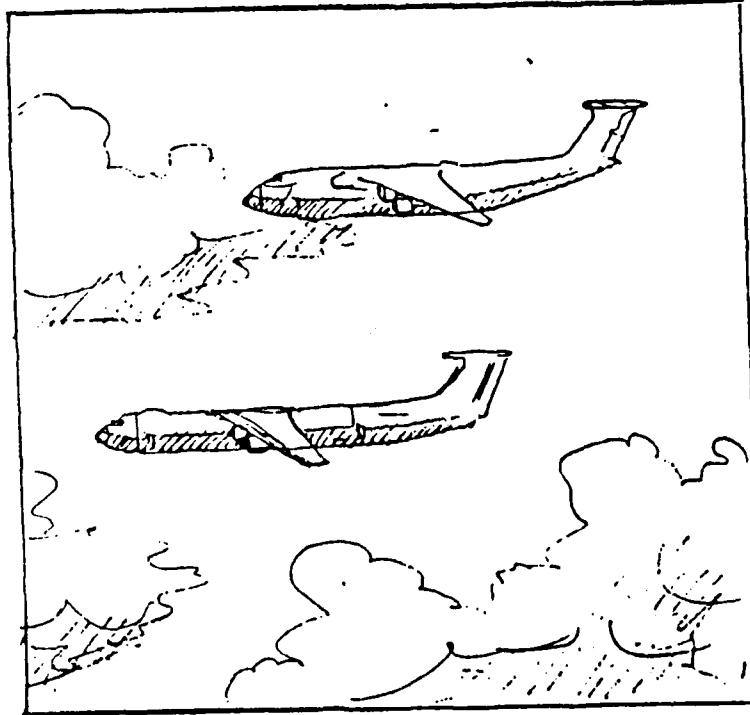
When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# APPARENT SIZE



Apparent size of a known object provides a very strong cue for determining distance. Unfortunately, distance estimation may be misleading for targets with similar characteristics but of different size than the known or expected objects.

When, in your opinion, would this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|  |     |     |     |     |
|--|-----|-----|-----|-----|
| FORMATION FLIGHT                       | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS                      | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION                     | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE                    | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS                 | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS               | [ ] | [ ] | [ ] | [ ] |
| TERRAIN FOLLOWING/LOW ALTITUDE TACTICS | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER                   | [ ] | [ ] | [ ] | [ ] |
| BAR OPERATIONS*                        | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING*            | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS*            | [ ] | [ ] | [ ] | [ ] |

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# APPARENT BRIGHTNESS



Bright, clearly lit reference cues may appear closer than vague or dimly lit cues. Visual information obscured by clouds or fog may be perceived as being more distant than similar information viewed under clear conditions.

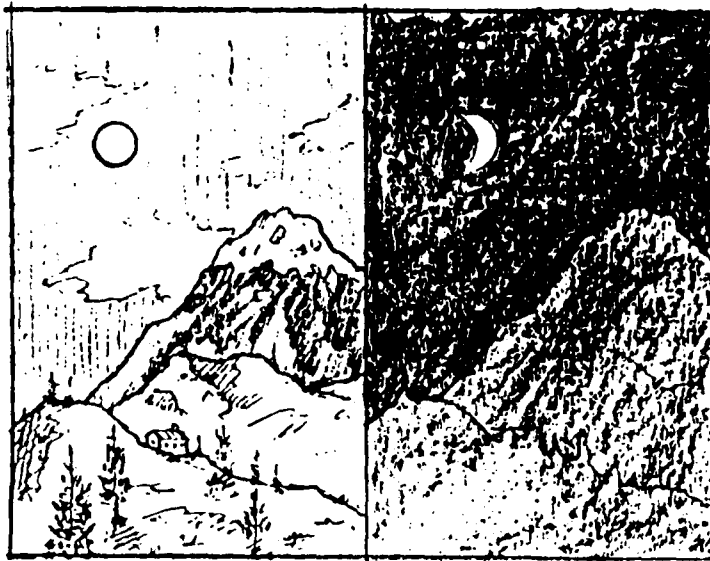
When, in your opinion, might this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|                             |     |     |     |     |
|-----------------------------|-----|-----|-----|-----|
| FORMATION FLIGHT            | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS           | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION          | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE         | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS      | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS    | [ ] | [ ] | [ ] | [ ] |
| NAP-OF-THE EARTH            | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER        | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*             | [ ] | [ ] | [ ] | [ ] |
| CONFINED SPACE MANEUVERING* | [ ] | [ ] | [ ] | [ ] |
| SMALL DECK SHIP OPERATIONS* | [ ] | [ ] | [ ] | [ ] |

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# INTERPOSITION/OCCCLUSION



Logically complete forms are often perceived as closer than those partially obscured by other objects. The distinction between complete and incomplete forms, and therefore information regarding depth, may not be as obvious in darkened conditions.

When, in your opinion, might this be a real problem for operational flying?

ALWAYS    OFTEN    SELDOM    NEVER

|                             |     |     |     |     |
|-----------------------------|-----|-----|-----|-----|
| FORMATION FLIGHT            | [ ] | [ ] | [ ] | [ ] |
| TANKER OPERATIONS           | [ ] | [ ] | [ ] | [ ] |
| TARGET ACQUISITION          | [ ] | [ ] | [ ] | [ ] |
| COLLISION AVOIDANCE         | [ ] | [ ] | [ ] | [ ] |
| DAY CARRIER OPERATIONS      | [ ] | [ ] | [ ] | [ ] |
| NIGHT CARRIER OPERATIONS    | [ ] | [ ] | [ ] | [ ] |
| NAP-OF-THE-EARTH            | [ ] | [ ] | [ ] | [ ] |
| LOW LEVEL OVER WATER        | [ ] | [ ] | [ ] | [ ] |
| SAR OPERATIONS*             | [ ] | [ ] | [ ] | [ ] |
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| SMALL DECK SHIP OPERATIONS* | [ ] | [ ] | [ ] | [ ] |

\*Helicopter pilots only



COMMENTS?

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APPENDIX B  
COMPLETE RESPONSE DATA

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF LIGHT SENSITIVITY

MARITIME PILOTS

|                          | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|--------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT         | 6            | 26            | 30           | 12            | 8                   |
| TANKER OPERATIONS        | 11           | 20            | 16           | 10            | 15                  |
| TARGET ACQUISITION       | 5            | 10            | 40           | 18            | 9                   |
| COLLISION AVOIDANCE      | 0            | 21            | 34           | 26            | 1                   |
| DAY CARRIER OPERATIONS   | 25           | 23            | 9            | 2             | 23                  |
| NIGHT CARRIER OPERATIONS | 14           | 4             | 20           | 22            | 22                  |
| TERRAIN FOLLOWING/LOW    |              |               |              |               |                     |
| ALTITUDE TACTICS         | 5            | 21            | 36           | 15            | 5                   |
| LOW LEVEL OVER WATER     | 3            | 33            | 28           | 13            | 5                   |

TACTICAL PILOTS

|                          | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|--------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT         | 12           | 55            | 46           | 9             | 2                   |
| TANKER OPERATIONS        | 8            | 42            | 56           | 14            | 4                   |
| TARGET ACQUISITION       | 6            | 38            | 54           | 25            | 1                   |
| COLLISION AVOIDANCE      | 3            | 45            | 44           | 31            | 1                   |
| DAY CARRIER OPERATIONS   | 65           | 40            | 12           | 3             | 4                   |
| NIGHT CARRIER OPERATIONS | 7            | 22            | 56           | 34            | 5                   |
| TERRAIN FOLLOWING/LOW    |              |               |              |               |                     |
| ALTITUDE TACTICS         | 21           | 43            | 43           | 12            | 5                   |
| LOW LEVEL OVER WATER     | 17           | 55            | 39           | 10            | 3                   |

HELICOPTER PILOTS

|                            | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|----------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT           | 7            | 58            | 44           | 20            | 6                   |
| TANKER OPERATIONS          | 13           | 23            | 33           | 10            | 56                  |
| TARGET ACQUISITION         | 8            | 28            | 47           | 19            | 33                  |
| COLLISION AVOIDANCE        | 7            | 36            | 50           | 32            | 10                  |
| DAY CARRIER OPERATIONS     | 59           | 46            | 11           | 4             | 15                  |
| NIGHT CARRIER OPERATIONS   | 5            | 34            | 56           | 29            | 11                  |
| TERRAIN FOLLOWING/LOW      |              |               |              |               |                     |
| ALTITUDE TACTICS           | 17           | 41            | 45           | 27            | 5                   |
| LOW LEVEL OVER WATER       | 15           | 53            | 38           | 21            | 8                   |
| SAR OPERATIONS*            | 5            | 42            | 48           | 26            | 14                  |
| CONFINED SPACE MANEUVERING | 8            | 58            | 44           | 20            | 5                   |
| SMALL DECK SHIP OPERATION  | 7            | 50            | 47           | 28            | 3                   |

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF BLIND SPOT

MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 7     | 29     | 25    | 15     | 6            |
| TANKER OPERATIONS                         | 13    | 28     | 17    | 8      | 16           |
| TARGET ACQUISITION                        | 10    | 21     | 29    | 11     | 11           |
| COLLISION AVOIDANCE                       | 1     | 25     | 32    | 23     | 1            |
| DAY CARRIER OPERATIONS                    | 18    | 20     | 12    | 7      | 25           |
| NIGHT CARRIER OPERATIONS                  | 15    | 13     | 22    | 9      | 23           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 9     | 32     | 25    | 9      | 7            |
| LOW LEVEL OVER WATER                      | 13    | 37     | 17    | 7      | 8            |

TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 19    | 60     | 32    | 9      | 4            |
| TANKER OPERATIONS                         | 18    | 55     | 33    | 9      | 9            |
| TARGET ACQUISITION                        | 14    | 49     | 44    | 13     | 4            |
| COLLISION AVOIDANCE                       | 10    | 46     | 43    | 21     | 4            |
| DAY CARRIER OPERATIONS                    | 35    | 56     | 19    | 8      | 6            |
| NIGHT CARRIER OPERATIONS                  | 13    | 52     | 33    | 19     | 7            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 20    | 59     | 30    | 10     | 5            |
| LOW LEVEL OVER WATER                      | 20    | 70     | 21    | 7      | 6            |

HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 13    | 62     | 34    | 15     | 11           |
| TANKER OPERATIONS                         | 14    | 47     | 15    | 6      | 53           |
| TARGET ACQUISITION                        | 6     | 52     | 34    | 10     | 33           |
| COLLISION AVOIDANCE                       | 7     | 35     | 52    | 27     | 14           |
| DAY CARRIER OPERATIONS                    | 26    | 65     | 19    | 5      | 20           |
| NIGHT CARRIER OPERATIONS                  | 7     | 59     | 36    | 15     | 18           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 13    | 51     | 46    | 14     | 11           |
| LOW LEVEL OVER WATER                      | 18    | 71     | 26    | 9      | 11           |
| SAR OPERATIONS*                           | 9     | 56     | 41    | 14     | 15           |
| CONFINED SPACE MANEUVERING                | 17    | 61     | 30    | 23     | 4            |
| SMALL DECK SHIP OPERATION                 | 13    | 66     | 30    | 22     | 4            |

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF FLASH BLINDNESS

MARITIME PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 5     | 13     | 32    | 25     | 7            |
| TANKER OPERATIONS        | 7     | 13     | 28    | 18     | 16           |
| TARGET ACQUISITION       | 4     | 19     | 34    | 17     | 8            |
| COLLISION AVOIDANCE      | 1     | 20     | 35    | 22     | 4            |
| DAY CARRIER OPERATIONS   | 24    | 25     | 8     | 3      | 22           |
| NIGHT CARRIER OPERATIONS | 9     | 6      | 30    | 16     | 21           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 3     | 11     | 46    | 17     | 5            |
| LOW LEVEL OVER WATER     | 0     | 20     | 43    | 16     | 3            |

TACTICAL PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 6     | 35     | 46    | 35     | 2            |
| TANKER OPERATIONS        | 7     | 36     | 44    | 30     | 7            |
| TARGET ACQUISITION       | 7     | 38     | 47    | 30     | 2            |
| COLLISION AVOIDANCE      | 6     | 37     | 38    | 41     | 2            |
| DAY CARRIER OPERATIONS   | 63    | 39     | 10    | 7      | 5            |
| NIGHT CARRIER OPERATIONS | 1     | 38     | 32    | 50     | 3            |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 9     | 49     | 33    | 30     | 3            |
| LOW LEVEL OVER WATER     | 13    | 50     | 29    | 28     | 4            |

HELICOPTER PILOTS

|                            | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|----------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT           | 3     | 36     | 43    | 44     | 9            |
| TANKER OPERATIONS          | 7     | 25     | 28    | 27     | 48           |
| TARGET ACQUISITION         | 4     | 29     | 42    | 27     | 33           |
| COLLISION AVOIDANCE        | 3     | 37     | 49    | 33     | 13           |
| DAY CARRIER OPERATIONS     | 59    | 42     | 8     | 8      | 18           |
| NIGHT CARRIER OPERATIONS   | 1     | 27     | 51    | 40     | 16           |
| TERRAIN FOLLOWING/LOW      |       |        |       |        |              |
| ALTITUDE TACTICS           | 6     | 34     | 41    | 44     | 10           |
| LOW LEVEL OVER WATER       | 6     | 43     | 33    | 45     | 8            |
| SAR OPERATIONS*            | 4     | 32     | 46    | 40     | 13           |
| CONFINED SPACE MANEUVERING | 5     | 35     | 45    | 46     | 4            |
| SMALL DECK SHIP OPERATION  | 3     | 36     | 43    | 50     | 3            |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF COLORS IN DIM LIGHT

### MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 12    | 41     | 12    | 8      | 9            |
| TANKER OPERATIONS                         | 12    | 35     | 11    | 7      | 17           |
| TARGET ACQUISITION                        | 7     | 27     | 28    | 10     | 10           |
| COLLISION AVOIDANCE                       | 4     | 36     | 23    | 13     | 6            |
| DAY CARRIER OPERATIONS                    | 26    | 23     | 7     | 2      | 24           |
| NIGHT CARRIER OPERATIONS                  | 12    | 23     | 16    | 7      | 24           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 7     | 29     | 25    | 12     | 9            |
| LOW LEVEL OVER WATER                      | 7     | 40     | 20    | 9      | 6            |

### TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 32    | 61     | 26    | 3      | 2            |
| TANKER OPERATIONS                         | 20    | 68     | 24    | 6      | 6            |
| TARGET ACQUISITION                        | 19    | 42     | 52    | 8      | 3            |
| COLLISION AVOIDANCE                       | 25    | 57     | 33    | 7      | 2            |
| DAY CARRIER OPERATIONS                    | 62    | 42     | 9     | 6      | 5            |
| NIGHT CARRIER OPERATIONS                  | 15    | 47     | 37    | 21     | 4            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 15    | 43     | 46    | 16     | 4            |
| LOW LEVEL OVER WATER                      | 31    | 38     | 37    | 14     | 4            |

### HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 18    | 75     | 23    | 9      | 10           |
| TANKER OPERATIONS                         | 13    | 51     | 17    | 4      | 50           |
| TARGET ACQUISITION                        | 7     | 50     | 39    | 10     | 29           |
| COLLISION AVOIDANCE                       | 15    | 58     | 38    | 10     | 14           |
| DAY CARRIER OPERATIONS                    | 56    | 49     | 8     | 2      | 20           |
| NIGHT CARRIER OPERATIONS                  | 12    | 47     | 45    | 12     | 19           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 15    | 51     | 40    | 17     | 12           |
| LOW LEVEL OVER WATER                      | 21    | 65     | 23    | 13     | 13           |
| SAR OPERATIONS*                           | 15    | 49     | 41    | 16     | 14           |
| CONFINED SPACE MANEUVERING                | 19    | 65     | 33    | 13     | 5            |
| SMALL DECK SHIP OPERATION                 | 17    | 60     | 39    | 15     | 4            |

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF AUTOKINESIS

MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 11    | 29     | 23    | 11     | 8            |
| TANKER OPERATIONS                         | 14    | 22     | 20    | 10     | 16           |
| TARGET ACQUISITION                        | 5     | 21     | 36    | 12     | 8            |
| COLLISION AVOIDANCE                       | 8     | 23     | 32    | 16     | 3            |
| DAY CARRIER OPERATIONS                    | 38    | 14     | 4     | 1      | 25           |
| NIGHT CARRIER OPERATIONS                  | 14    | 14     | 25    | 7      | 22           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 7     | 31     | 27    | 10     | 7            |
| LOW LEVEL OVER WATER                      | 10    | 32     | 23    | 14     | 3            |

TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 11    | 34     | 49    | 29     | 1            |
| TANKER OPERATIONS                         | 11    | 31     | 50    | 26     | 6            |
| TARGET ACQUISITION                        | 10    | 46     | 40    | 27     | 1            |
| COLLISION AVOIDANCE                       | 7     | 36     | 49    | 29     | 3            |
| DAY CARRIER OPERATIONS                    | 87    | 25     | 4     | 3      | 5            |
| NIGHT CARRIER OPERATIONS                  | 10    | 38     | 42    | 30     | 4            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 23    | 49     | 36    | 13     | 3            |
| LOW LEVEL OVER WATER                      | 22    | 47     | 37    | 14     | 4            |

HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 10    | 44     | 53    | 18     | 10           |
| TANKER OPERATIONS                         | 10    | 29     | 33    | 11     | 52           |
| TARGET ACQUISITION                        | 7     | 29     | 50    | 17     | 32           |
| COLLISION AVOIDANCE                       | 2     | 35     | 58    | 23     | 17           |
| DAY CARRIER OPERATIONS                    | 73    | 30     | 6     | 1      | 25           |
| NIGHT CARRIER OPERATIONS                  | 7     | 34     | 52    | 24     | 18           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 11    | 59     | 36    | 17     | 12           |
| LOW LEVEL OVER WATER                      | 7     | 46     | 48    | 22     | 12           |
| SAR OPERATIONS*                           | 4     | 30     | 59    | 24     | 18           |
| CONFINED SPACE MANEUVERING                | 15    | 62     | 33    | 17     | 8            |
| SMALL DECK SHIP OPERATION                 | 11    | 48     | 47    | 22     | 7            |



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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF VEILING GLARE

MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 3     | 9      | 22    | 41     | 7            |
| TANKER OPERATIONS                         | 8     | 8      | 21    | 29     | 16           |
| TARGET ACQUISITION                        | 2     | 10     | 25    | 36     | 9            |
| COLLISION AVOIDANCE                       | 2     | 10     | 25    | 42     | 3            |
| DAY CARRIER OPERATIONS                    | 10    | 10     | 13    | 28     | 21           |
| NIGHT CARRIER OPERATIONS                  | 15    | 10     | 11    | 24     | 22           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 3     | 8      | 21    | 30     | 20           |
| LOW LEVEL OVER WATER                      | 0     | 14     | 21    | 43     | 4            |

TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 4     | 31     | 36    | 50     | 3            |
| TANKER OPERATIONS                         | 6     | 30     | 36    | 46     | 6            |
| TARGET ACQUISITION                        | 4     | 20     | 40    | 58     | 2            |
| COLLISION AVOIDANCE                       | 2     | 22     | 45    | 53     | 2            |
| DAY CARRIER OPERATIONS                    | 16    | 32     | 31    | 42     | 3            |
| NIGHT CARRIER OPERATIONS                  | 17    | 31     | 18    | 51     | 7            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 5     | 23     | 43    | 47     | 6            |
| LOW LEVEL OVER WATER                      | 5     | 23     | 47    | 47     | 2            |

HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 1     | 17     | 46    | 59     | 12           |
| TANKER OPERATIONS                         | 5     | 17     | 26    | 38     | 49           |
| TARGET ACQUISITION                        | 2     | 12     | 46    | 43     | 32           |
| COLLISION AVOIDANCE                       | 1     | 11     | 56    | 51     | 16           |
| DAY CARRIER OPERATIONS                    | 12    | 30     | 41    | 31     | 21           |
| NIGHT CARRIER OPERATIONS                  | 11    | 25     | 32    | 45     | 22           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 3     | 12     | 48    | 59     | 13           |
| LOW LEVEL OVER WATER                      | 5     | 12     | 60    | 48     | 10           |
| SAR OPERATIONS*                           | 3     | 22     | 50    | 46     | 14           |
| CONFINED SPACE MANEUVERING                | 7     | 26     | 44    | 51     | 7            |
| SMALL DECK SHIP OPERATION                 | 6     | 26     | 46    | 51     | 6            |

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF DARK FOCUS

MARITIME PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 15    | 27     | 18    | 15     | 7            |
| TANKER OPERATIONS        | 15    | 24     | 13    | 13     | 17           |
| TARGET ACQUISITION       | 7     | 17     | 37    | 12     | 9            |
| COLLISION AVOIDANCE      | 2     | 12     | 37    | 28     | 3            |
| DAY CARRIER OPERATIONS   | 14    | 22     | 15    | 8      | 23           |
| NIGHT CARRIER OPERATIONS | 11    | 24     | 13    | 10     | 24           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 12    | 29     | 21    | 13     | 7            |
| LOW LEVEL OVER WATER     | 6     | 31     | 27    | 13     | 5            |

TACTICAL PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 15    | 62     | 29    | 16     | 2            |
| TANKER OPERATIONS        | 12    | 62     | 30    | 12     | 8            |
| TARGET ACQUISITION       | 9     | 27     | 50    | 37     | 1            |
| COLLISION AVOIDANCE      | 4     | 18     | 56    | 44     | 2            |
| DAY CARRIER OPERATIONS   | 27    | 60     | 24    | 11     | 2            |
| NIGHT CARRIER OPERATIONS | 22    | 51     | 29    | 18     | 4            |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 11    | 62     | 34    | 16     | 1            |
| LOW LEVEL OVER WATER     | 10    | 54     | 44    | 14     | 2            |

HELICOPTER PILOTS

|                            | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|----------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT           | 19    | 55     | 36    | 12     | 13           |
| TANKER OPERATIONS          | 18    | 35     | 26    | 8      | 48           |
| TARGET ACQUISITION         | 10    | 40     | 38    | 17     | 30           |
| COLLISION AVOIDANCE        | 2     | 24     | 54    | 39     | 16           |
| DAY CARRIER OPERATIONS     | 26    | 56     | 24    | 8      | 21           |
| NIGHT CARRIER OPERATIONS   | 14    | 56     | 34    | 10     | 21           |
| TERRAIN FOLLOWING/LOW      |       |        |       |        |              |
| ALTITUDE TACTICS           | 14    | 57     | 37    | 14     | 13           |
| LOW LEVEL OVER WATER       | 10    | 54     | 42    | 18     | 11           |
| SAR OPERATIONS*            | 4     | 57     | 41    | 18     | 15           |
| CONFINED SPACE MANEUVERING | 23    | 59     | 32    | 13     | 8            |
| SMALL DECK SHIP OPERATION  | 20    | 59     | 33    | 15     | 8            |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF PERSPECTIVE

### MARITIME PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 14    | 29     | 19    | 11     | 9            |
| TANKER OPERATIONS        | 15    | 26     | 13    | 11     | 17           |
| TARGET ACQUISITION       | 5     | 18     | 36    | 16     | 7            |
| COLLISION AVOIDANCE      | 8     | 31     | 28    | 12     | 3            |
| DAY CARRIER OPERATIONS   | 14    | 29     | 11    | 4      | 24           |
| NIGHT CARRIER OPERATIONS | 10    | 18     | 16    | 14     | 24           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 5     | 12     | 36    | 23     | 6            |
| LOW LEVEL OVER WATER     | 10    | 23     | 27    | 16     | 6            |

### TACTICAL PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 24    | 44     | 38    | 15     | 3            |
| TANKER OPERATIONS        | 18    | 45     | 42    | 13     | 6            |
| TARGET ACQUISITION       | 5     | 25     | 60    | 31     | 3            |
| COLLISION AVOIDANCE      | 10    | 41     | 47    | 23     | 3            |
| DAY CARRIER OPERATIONS   | 48    | 46     | 18    | 4      | 8            |
| NIGHT CARRIER OPERATIONS | 14    | 31     | 46    | 27     | 6            |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 22    | 64     | 35    | 3      | 3            |
| LOW LEVEL OVER WATER     | 11    | 45     | 44    | 20     | 4            |

### HELICOPTER PILOTS

|                            | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|----------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT           | 13    | 53     | 30    | 25     | 14           |
| TANKER OPERATIONS          | 13    | 31     | 25    | 15     | 51           |
| TARGET ACQUISITION         | 6     | 21     | 52    | 24     | 32           |
| COLLISION AVOIDANCE        | 4     | 40     | 49    | 26     | 16           |
| DAY CARRIER OPERATIONS     | 36    | 54     | 16    | 6      | 23           |
| NIGHT CARRIER OPERATIONS   | 10    | 27     | 53    | 23     | 22           |
| TERRAIN FOLLOWING/LOW      |       |        |       |        |              |
| ALTITUDE TACTICS           | 3     | 23     | 60    | 34     | 15           |
| LOW LEVEL OVER WATER       | 13    | 47     | 37    | 26     | 12           |
| SAR OPERATIONS*            | 11    | 37     | 47    | 24     | 16           |
| CONFINED SPACE MANEUVERING | 13    | 41     | 42    | 29     | 10           |
| SMALL DECK SHIP OPERATION  | 14    | 37     | 50    | 25     | 9            |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF RELATIONSHIP TO HORIZON

### MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 6     | 25     | 32    | 11     | 8            |
| TANKER OPERATIONS                         | 11    | 23     | 21    | 10     | 17           |
| TARGET ACQUISITION                        | 4     | 21     | 35    | 13     | 9            |
| COLLISION AVOIDANCE                       | 1     | 23     | 36    | 17     | 5            |
| DAY CARRIER OPERATIONS                    | 15    | 25     | 11    | 7      | 24           |
| NIGHT CARRIER OPERATIONS                  | 14    | 23     | 15    | 6      | 24           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 5     | 21     | 30    | 20     | 6            |
| LOW LEVEL OVER WATER                      | 5     | 26     | 27    | 19     | 5            |

### TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 22    | 49     | 34    | 15     | 4            |
| TANKER OPERATIONS                         | 15    | 58     | 33    | 10     | 8            |
| TARGET ACQUISITION                        | 6     | 40     | 56    | 18     | 4            |
| COLLISION AVOIDANCE                       | 8     | 42     | 49    | 21     | 4            |
| DAY CARRIER OPERATIONS                    | 24    | 66     | 22    | 7      | 5            |
| NIGHT CARRIER OPERATIONS                  | 24    | 56     | 25    | 10     | 9            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 7     | 33     | 54    | 26     | 4            |
| LOW LEVEL OVER WATER                      | 8     | 50     | 43    | 19     | 4            |

### HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 10    | 56     | 40    | 14     | 15           |
| TANKER OPERATIONS                         | 10    | 37     | 31    | 8      | 49           |
| TARGET ACQUISITION                        | 4     | 31     | 44    | 25     | 31           |
| COLLISION AVOIDANCE                       | 4     | 34     | 51    | 30     | 16           |
| DAY CARRIER OPERATIONS                    | 26    | 64     | 14    | 8      | 23           |
| NIGHT CARRIER OPERATIONS                  | 17    | 51     | 30    | 15     | 22           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 9     | 46     | 40    | 25     | 15           |
| LOW LEVEL OVER WATER                      | 11    | 60     | 30    | 21     | 13           |
| SAR OPERATIONS*                           | 9     | 53     | 41    | 14     | 18           |
| CONFINED SPACE MANEUVERING                | 21    | 63     | 31    | 9      | 11           |
| SMALL DECK SHIP OPERATION                 | 19    | 64     | 31    | 11     | 10           |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF MOTION PARALLAX

### MARITIME PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 5     | 15     | 31    | 23     | 8            |
| TANKER OPERATIONS        | 9     | 13     | 30    | 12     | 18           |
| TARGET ACQUISITION       | 6     | 22     | 34    | 10     | 10           |
| COLLISION AVOIDANCE      | 2     | 17     | 39    | 19     | 5            |
| DAY CARRIER OPERATIONS   | 11    | 30     | 11    | 5      | 25           |
| NIGHT CARRIER OPERATIONS | 10    | 26     | 15    | 6      | 25           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 8     | 29     | 22    | 14     | 9            |
| LOW LEVEL OVER WATER     | 8     | 36     | 20    | 11     | 7            |

### TACTICAL PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 8     | 44     | 46    | 19     | 7            |
| TANKER OPERATIONS        | 6     | 42     | 48    | 18     | 10           |
| TARGET ACQUISITION       | 10    | 56     | 38    | 13     | 7            |
| COLLISION AVOIDANCE      | 3     | 38     | 47    | 29     | 7            |
| DAY CARRIER OPERATIONS   | 25    | 67     | 19    | 5      | 8            |
| NIGHT CARRIER OPERATIONS | 22    | 59     | 26    | 6      | 11           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 12    | 62     | 33    | 10     | 7            |
| LOW LEVEL OVER WATER     | 14    | 73     | 22    | 8      | 7            |

### HELICOPTER PILOTS

|                            | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|----------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT           | 9     | 39     | 43    | 28     | 16           |
| TANKER OPERATIONS          | 7     | 28     | 31    | 19     | 50           |
| TARGET ACQUISITION         | 5     | 36     | 44    | 15     | 35           |
| COLLISION AVOIDANCE        | 3     | 21     | 64    | 28     | 19           |
| DAY CARRIER OPERATIONS     | 21    | 56     | 27    | 6      | 25           |
| NIGHT CARRIER OPERATIONS   | 16    | 42     | 33    | 19     | 25           |
| TERRAIN FOLLOWING/LOW      |       |        |       |        |              |
| ALTITUDE TACTICS           | 11    | 48     | 41    | 17     | 18           |
| LOW LEVEL OVER WATER       | 15    | 60     | 30    | 13     | 17           |
| SAR OPERATIONS*            | 10    | 63     | 29    | 11     | 22           |
| CONFINED SPACE MANEUVERING | 21    | 63     | 25    | 11     | 15           |
| SMALL DECK SHIP OPERATION  | 17    | 64     | 26    | 14     | 14           |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF APPARENT SIZE

### MARITIME PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 4     | 23     | 29    | 17     | 9            |
| TANKER OPERATIONS                         | 8     | 17     | 26    | 13     | 18           |
| TARGET ACQUISITION                        | 4     | 25     | 28    | 15     | 10           |
| COLLISION AVOIDANCE                       | 1     | 21     | 32    | 23     | 5            |
| DAY CARRIER OPERATIONS                    | 14    | 30     | 7     | 6      | 25           |
| NIGHT CARRIER OPERATIONS                  | 11    | 32     | 8     | 6      | 25           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 9     | 34     | 18    | 12     | 9            |
| LOW LEVEL OVER WATER                      | 11    | 34     | 22    | 8      | 7            |

### TACTICAL PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 15    | 53     | 35    | 17     | 4            |
| TANKER OPERATIONS                         | 4     | 54     | 44    | 16     | 6            |
| TARGET ACQUISITION                        | 8     | 49     | 39    | 23     | 5            |
| COLLISION AVOIDANCE                       | 7     | 36     | 57    | 20     | 4            |
| DAY CARRIER OPERATIONS                    | 35    | 57     | 23    | 3      | 6            |
| NIGHT CARRIER OPERATIONS                  | 40    | 53     | 19    | 4      | 8            |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 14    | 61     | 34    | 11     | 4            |
| LOW LEVEL OVER WATER                      | 19    | 67     | 29    | 5      | 4            |

### HELICOPTER PILOTS

|   | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|---|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT                          | 8     | 65     | 31    | 13     | 18           |
| TANKER OPERATIONS                         | 8     | 34     | 32    | 10     | 51           |
| TARGET ACQUISITION                        | 4     | 38     | 46    | 12     | 35           |
| COLLISION AVOIDANCE                       | 4     | 19     | 67    | 26     | 19           |
| DAY CARRIER OPERATIONS                    | 28    | 58     | 21    | 4      | 24           |
| NIGHT CARRIER OPERATIONS                  | 18    | 56     | 24    | 12     | 25           |
| TERRAIN FOLLOWING/LOW<br>ALTITUDE TACTICS | 12    | 54     | 41    | 9      | 19           |
| LOW LEVEL OVER WATER                      | 18    | 66     | 25    | 8      | 18           |
| SAR OPERATIONS*                           | 13    | 63     | 23    | 12     | 21           |
| CONFINED SPACE MANEUVERING                | 21    | 69     | 21    | 9      | 15           |
| SMALL DECK SHIP OPERATION                 | 17    | 68     | 21    | 15     | 14           |

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## COMPLETE RESPONSE DATA FOR THE TOPIC OF APPARENT BRIGHTNESS

### MARITIME PILOTS

|                          | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|--------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT         | 6            | 26            | 29           | 12            | 9                   |
| TANKER OPERATIONS        | 9            | 23            | 21           | 11            | 18                  |
| TARGET ACQUISITION       | 6            | 16            | 36           | 13            | 11                  |
| COLLISION AVOIDANCE      | 4            | 17            | 41           | 15            | 5                   |
| DAY CARRIER OPERATIONS   | 18           | 25            | 11           | 4             | 24                  |
| NIGHT CARRIER OPERATIONS | 12           | 12            | 21           | 14            | 23                  |
| TERRAIN FOLLOWING/LOW    |              |               |              |               |                     |
| ALTITUDE TACTICS         | 6            | 15            | 26           | 17            | 18                  |
| LOW LEVEL OVER WATER     | 5            | 23            | 36           | 12            | 6                   |

### TACTICAL PILOTS

|                          | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|--------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT         | 10           | 57            | 40           | 13            | 4                   |
| TANKER OPERATIONS        | 8            | 59            | 37           | 12            | 8                   |
| TARGET ACQUISITION       | 5            | 33            | 58           | 23            | 5                   |
| COLLISION AVOIDANCE      | 5            | 39            | 46           | 28            | 6                   |
| DAY CARRIER OPERATIONS   | 37           | 54            | 18           | 9             | 6                   |
| NIGHT CARRIER OPERATIONS | 17           | 39            | 37           | 23            | 8                   |
| TERRAIN FOLLOWING/LOW    |              |               |              |               |                     |
| ALTITUDE TACTICS         | 7            | 36            | 42           | 28            | 11                  |
| LOW LEVEL OVER WATER     | 8            | 51            | 42           | 18            | 5                   |

### HELICOPTER PILOTS

|                            | <u>NEVER</u> | <u>SELDOM</u> | <u>OFTEN</u> | <u>ALWAYS</u> | <u>NO RESPONSES</u> |
|----------------------------|--------------|---------------|--------------|---------------|---------------------|
| FORMATION FLIGHT           | 10           | 60            | 33           | 16            | 16                  |
| TANKER OPERATIONS          | 10           | 38            | 32           | 7             | 48                  |
| TARGET ACQUISITION         | 4            | 18            | 65           | 14            | 34                  |
| COLLISION AVOIDANCE        | 4            | 24            | 59           | 30            | 18                  |
| DAY CARRIER OPERATIONS     | 35           | 54            | 12           | 8             | 26                  |
| NIGHT CARRIER OPERATIONS   | 6            | 36            | 42           | 26            | 25                  |
| TERRAIN FOLLOWING/LOW      |              |               |              |               |                     |
| ALTITUDE TACTICS           | 6            | 23            | 54           | 36            | 16                  |
| LOW LEVEL OVER WATER       | 6            | 55            | 40           | 20            | 14                  |
| SAR OPERATIONS*            | 4            | 47            | 48           | 18            | 18                  |
| CONFINED SPACE MANEUVERING | 11           | 49            | 43           | 21            | 11                  |
| SMALL DECK SHIP OPERATION  | 10           | 51            | 39           | 23            | 12                  |

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COMPLETE RESPONSE DATA  
FOR THE TOPIC OF OVERLAY AND OCCLUSION

MARITIME PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 8     | 34     | 19    | 10     | 11           |
| TANKER OPERATIONS        | 11    | 27     | 20    | 5      | 19           |
| TARGET ACQUISITION       | 6     | 19     | 33    | 13     | 11           |
| COLLISION AVOIDANCE      | 4     | 19     | 33    | 18     | 8            |
| DAY CARRIER OPERATIONS   | 15    | 30     | 9     | 2      | 26           |
| NIGHT CARRIER OPERATIONS | 11    | 20     | 18    | 7      | 26           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 3     | 10     | 31    | 21     | 17           |
| LOW LEVEL OVER WATER     | 3     | 21     | 34    | 15     | 9            |

TACTICAL PILOTS

|                          | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|--------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT         | 16    | 63     | 25    | 12     | 8            |
| TANKER OPERATIONS        | 18    | 61     | 25    | 9      | 11           |
| TARGET ACQUISITION       | 5     | 36     | 48    | 27     | 8            |
| COLLISION AVOIDANCE      | 6     | 48     | 40    | 22     | 8            |
| DAY CARRIER OPERATIONS   | 34    | 64     | 12    | 5      | 9            |
| NIGHT CARRIER OPERATIONS | 23    | 37     | 39    | 14     | 11           |
| TERRAIN FOLLOWING/LOW    |       |        |       |        |              |
| ALTITUDE TACTICS         | 2     | 22     | 54    | 33     | 13           |
| LOW LEVEL OVER WATER     | 10    | 46     | 38    | 21     | 9            |

HELICOPTER PILOTS

|                            | NEVER | SELDOM | OFTEN | ALWAYS | NO RESPONSES |
|----------------------------|-------|--------|-------|--------|--------------|
| FORMATION FLIGHT           | 9     | 55     | 39    | 15     | 17           |
| TANKER OPERATIONS          | 10    | 39     | 26    | 8      | 52           |
| TARGET ACQUISITION         | 3     | 25     | 47    | 24     | 36           |
| COLLISION AVOIDANCE        | 2     | 27     | 59    | 27     | 20           |
| DAY CARRIER OPERATIONS     | 35    | 57     | 10    | 6      | 27           |
| NIGHT CARRIER OPERATIONS   | 9     | 32     | 46    | 20     | 28           |
| TERRAIN FOLLOWING/LOW      |       |        |       |        |              |
| ALTITUDE TACTICS           | 2     | 12     | 64    | 39     | 18           |
| LOW LEVEL OVER WATER       | 7     | 54     | 41    | 16     | 17           |
| SAR OPERATIONS*            | 5     | 52     | 39    | 19     | 20           |
| CONFINED SPACE MANEUVERING | 9     | 38     | 53    | 21     | 14           |
| SMALL DECK SHIP OPERATION  | 12    | 45     | 48    | 16     | 14           |



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